No. 37 October 1, 1957

FISH AND WILDLIFE MANAGEMENT REPORT

PROVINCE OF ONTARIO

DEPARTMENT OF LANDS AND FORESTS

Division of Fish and Wildlife

Hon. Clare E. Mapledoram
Minister

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Deputy Minister

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(THESE REPORTS ARE FOR INTRA-DEPARTMENTAL INFORMATION AND NOT FOR PUBLICATION)

THE MOOSE SEASON IN THE DISTRICT OF SAULT STE. MARIE, 1956

compiled by
A. J. Herridge

This report is an assessment of the open season on moose in the District of Sault Ste. Marie during 1956. It is based upon reports supplied by hunters, interviews conducted by personnel of the Department, and population data.

The Season in 1956

For residents of Ontario, the season extended from October 13th to December 24th. For non-residents, the open season was from October 13th to November 15th. In both cases, the entire District, with the exception of St. Joseph's Island, was open to the shooting of moose of all ages and of either sex.

Previous Seasons

In 1955, the following seasons prevailed:

- Non-resident hunters - Northern section of the District open for the taking of any moose from October 15th to October 31st.

- Resident hunters - Northern section - any moose - October 15th-31st; November 26th to December 24th.
  - remainder of District - bull moose only - November 12th to December 17th.

Prior to 1955, there had been no open season, so far as non-residents were concerned, since 1948. There had been limited open seasons for residents, on bull moose only, in 1954 from November 26th to December 11th, in 1953 from November 26th to December 24th, and from November 26th to December 24th in 1952.

Weather Conditions

Generally speaking, the weather from opening day to the first week of November was unseasonably warm. The days were sunny and warm, although overnight temperatures often approached the freezing point. The following table lists noon temperatures at several points in the District during this period:

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Date	Peshu Lake	Sand Lake	Blind River	Soo	Averages
Oct. 15	64	58	57	64	61
Oct. 16	64	66	54	60	61
Oct. 17	70	65	63	76	68
Oct. 18	43	48	53	52	49
Oct. 19	54	58	54	54	55
Oct. 20	58	58	52	60	57
Oct. 21	64	52	52	60	57
Oct. 22	58	63	54	54	57
Oct. 23	43	39	52	48	45
Oct. 24	42		48	46	45
Oct. 25	55		52	54	54
Oct. 26	46		48	46	46
Oct. 27	44		52	54	50
Oct. 28			44		
Oct. 29			56		
Oct. 30			56		
Oct. 31			58		

License Sales

(a) Resident Hunters

Total licenses sold	1,517
Licensees who hunted in other districts	129
Bought licenses elsewhere, hunted in this District	24
Bought licenses, did not hunt	44
Estimated number of residents who hunted in this District	1,368

(b) Non-resident Hunters

Total licenses sold	209
Licensees who hunted in other districts	81
Estimated number of Non-residents hunting in this District.	128

(c) Resident and Non-resident Hunters

Total licenses sold in District	1,726
Total licensees who hunted in other districts	210
Total licensees who bought licenses elsewhere, hunted this District	24
Total who bought licenses this District, but did not hunt..	44
Total who hunted this District	1,496

Return of Questionnaires

A small proportion of the returns were sent in by hunters during the season and up until Christmas. These proved to be, for the most part, returns of hunters who had been successful. In early January a radio and television appeal was made. This was followed by letters enclosing returns to nonrespondents in mid-January and at the end of January. Early in February the delinquent licensees were contacted by telephone and by Conservation Officers.

Questionnaires returned by Non-resident hunters -
194 out of 209 (93%)
Questionnaires returned by Resident hunters -
1,429 out of 1,517 (94%)

Failure of the licensees to provide complete details regarding postal address was a frequent reason for failure to secure returns of questionnaires.

Reported Kill of Moose

	Bulls	Cows	Male Calves	Female Calves	Total Kill	Unsuc-cessful	Total Hunters	Percent Success
Residents	127	125	32	8	292	1077	1368	21.3
Non-resident	40	20	2	0	62	66	128	48.5
By all hunters	167	145	34	8	354*	1143	1496	23.6

It should be noted that these figures for hunter success, since they make no estimate of kill by hunters who failed to make a return, are probably higher than actually occurred. Experience has shown that successful hunters are much more likely to make reports than are unsuccessful ones.

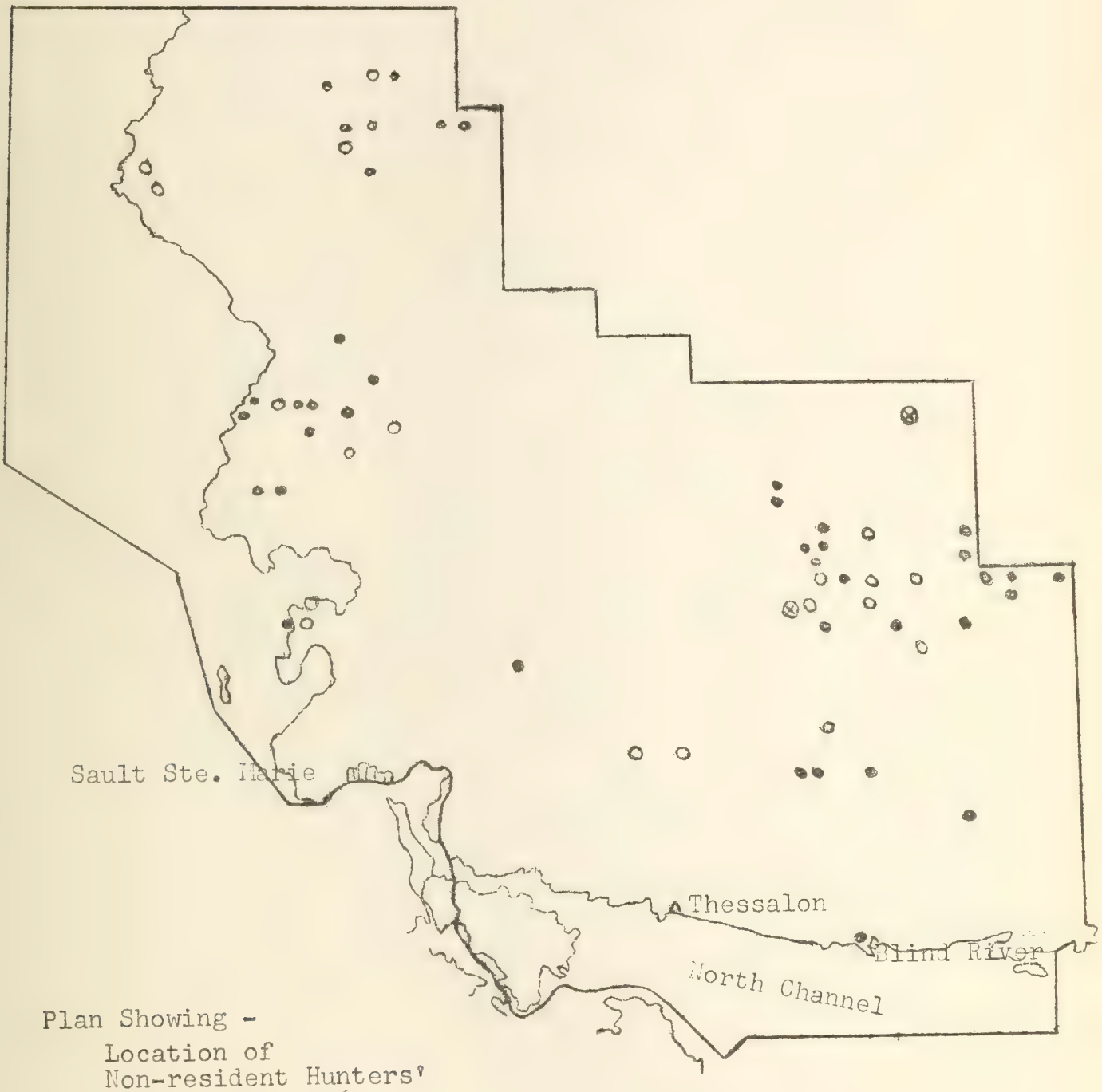
Comparison of Data of 1955 and 1956

	Residents		Non-residents		All Hunters	
	1955	1956	1955	1956	1955	1956
No. of Hunters	505	1368	36	128	541	1498
Returns Received	484	1280	30	119	514	1398
Kill - Bulls	90	127	5	40	95	167
- Cows	5	125	5	20	10	145
- Male Calves	5	32	1	2	6	34
- Female Calves	-	8	-	0	-	8
TOTAL	100	292	11	62	111	354*
Success -						
(Total Hunters)	19.7	21.3	30.6	48.5	20.5	23.4
(Total Returns)	20.6	22.8	36.6	52.2	21.6	25.0

* Revised later to 359.

SAULT STE. MARIE DISTRICT

Map No. 1



Plan Showing -
Location of
Non-resident Hunters'
Moose Kill, 1956.

- Bulls (40)
- Cows (20)
- Male Calves (2)

20 10 0 20 40

SAULT STE. MARIE DISTRICT

Map No. 2

Plan Showing -
Location of Resident
Hunters' Moose Kill,
1956.

20 10 0 20 40

SAULT STE. MARIE DISTRICT

Map No. 3

Plan Showing -
Moose 1955-1956

- 1 animal per 2-5 sq. miles
- 1 animal per 5-10 sq. miles
- 1 animal per 10+ sq. miles

20 10 0 20 40

Geographic Distribution of the Kill - See Maps No. 1 & 2

It will be noted that although there are still several townships in the inaccessible parts of the District where no moose were killed and that heavy kills did occur in a few easily accessible areas, generally speaking most of the District was hunted and did produce moose. The distribution of the kill in 1956 was much better than that in 1955.

On the basis of a District-wide assessment of trappers' reports, aerial surveys, reports from tourist outfitters, surveys by Conservation Officers, and other data, it was established that during the winter of 1955/56, following the open season of 1955, there were approximately 1400 moose in the District of Sault Ste. Marie. We are quite certain that this is a conservative estimate. The general distribution of these animals is indicated on Map 3.

Discussion

(a) Loss of Meat Due to Spoilage

Some unfavourable public reaction to the moose season was based on the premise that such an early opening would result in meat spoilage. Since the weather for the first three weeks of the season was unseasonably warm a great many persons assumed that the loss of moose meat due to spoilage would be excessive.

To determine as accurately as possible the amount of meat spoiled due to the warm weather, all our officers made enquiries for, and checked rumours of, instances of meat wastage. These enquiries were made of locker plants, tourist outfitters, guides, and in fact, the public at large.

In nearly every instance rumours of spoiled meat were unfounded and in the few cases found owners insisted meat was still good.

In analysing the results of the survey and in discussing the subject with members of Rod and Gun Clubs and a Member of Parliament, it is our firm conclusion that the amount of meat spoilage during the 1956 non-resident season was, if anything, less than that in previous seasons. In short, the earlier opening did not contribute to excessive losses of meat and this in a year when the weather was unseasonably warm for a good portion of the season.

(b) Numbers of Hunters

In 1956 there was an increase in numbers of Resident and Non-Resident moose hunters in the District of Sault Ste. Marie over 1955 of 171% and 255% respectively. No doubt this was due in large part, especially with respect to Non-Residents, to the considerably greater area open to hunting in 1956. In addition, the areas open in 1956 were much more accessible than those of 1955.

There is also good reason to believe that the widespread publicity which was given to the subject of moose hunting, arising out of controversies carried in the public press prior to the open season, attracted many hunters.

(c) Population, Hunting Pressure, and Harvest

In an earlier section of this report it is indicated that the moose population of the District after the close of the open season of 1955 was 1400. Studies of Dr. R. L. Peterson, of the Royal Ontario Museum of Zoology, and a number of other competent authorities have shown that in Ontario it is reasonable to expect an average annual increase of about 30% - 35% in moose populations.

Thus, if we accept the lower, or more conservative of these figures, it is not unreasonable to estimate that there were about 1820 moose in the District of Sault Ste. Marie at the beginning of the hunting season of 1956.

The total take of moose by hunters in this District in 1956 was 354*. This represents only about 19% of the moose population of the District, which is considerably less than the rate of increase in the herd and thus well within the safe limits of harvest of this important resource.

Comparison of Maps 1, 2 and 3 relates the distribution of moose in the District with distribution of the kill. It is gratifying to note that, for the most part, the highest harvest was concentrated in the areas best able to sustain a relatively high hunting pressure. There is no indication that hunters concentrated in the most easily accessible areas near centres of human population and decimated the relatively small populations of moose in these areas.

It would be very desirable to increase hunting pressure in many individual townships but the north central part of the District though presently inaccessible, is most in need of this additional hunting pressure.

Conclusions and Suggestions

Kill Survey Methods

(a) The first mailed reminder should be sent out one week before the end of the season.

(b) A total of three mailed reminders are apparently required for adequate returns. The second and third of these should be timed as indicated by a graph which plots the rate of returns daily.

(c) The radio appeal for returns in 1956 was not very effective in producing returns. If the production of returns is the only criterion to be used in evaluating such radio publicity then it is suggested that the money was not well spent.

* Revised later to 359.

(d) It is suggested that the district selling a license should be responsible for the return of that license. All of our staff are agreed that this is proper but there seems to be some question in the minds of personnel from other districts, hence the inclusion of this recommendation.

(e) It is recommended that all districts consider their data unreliable until 80% of the returns have been received. Only in this way can bias be removed when comparing data between districts.

(f) If in 1957 moose licenses are to be issued by regular license issuers in addition to Department outlets, it is hoped that the district might be advised of a list of such issuers well in advance of the season so that we may contact these issuers and ensure accurate records.

(g) A larger hunter return form of perhaps postcard size would be less liable to loss by licensees and by post office personnel. One additional comment concerning the return suggests that there is little, if any, need for obliterating some of the questions by stamping 1956 in bold type across its face.

(h) Some consideration of a reward system for returns may be due for some consideration.

Size of Kill

In general it was concluded that the size of kill was in line with numbers available for cropping under reasonable management.

Geographic Distribution

Our kill was much better distributed over the district in 1956 than it was in 1955. This improvement appears to be related to the earlier season and associated good hunting weather which allowed access to most of the District. Since there are still areas of the District which were not hunted in 1956 we must continue to emphasize the need of finding methods to encourage hunters to hunt in these presently uncropped areas.

Temporal Distribution of the Kill

It is noted that the kill in December of the 1956 season was much higher than that of December in the previous year. It appears safe to conclude that the main factor causing this difference was good travel and hunting weather. This emphasizes the necessity of including weather data in such returns annually. It is suggested further that the weather in 1955 be added to the 1955 report in as much detail as can be recalled by our staff.

Sex Ratio of the Kill

The difference in sex ratios of the kills by residents as compared to non-residents should be noted. The overall sex ratio of the kill being slightly in favour of cows is quite acceptable to our staff.

Calves in the Kill

There is a considerable concern about the shooting of calves amongst our staff. As long as our population of calves was normal in the 1956 season then the number taken is quite acceptable. If, however, the calf population was sub-normal, and we have no way of knowing whether or not this was so, then we would very easily be alarmed at even such a small kill as occurred in 1956. We do not know why such a small number of calves were killed. We do not know if it was a reflection on a small number of calves available or if it was a matter of hunter selection. We are also concerned about the small number of females amongst the calves that were shot. The data indicate in some degree there was selection by hunters, especially during the earliest part of the season. In October calves made up 10% of the kill, in November 20%, and in December 15%. It is recommended that on tne hunter return form, where hunters are asked to record the number of moose seen, the question should be altered to include a breakdown into bulls, cows and calves seen. It is further recommended that our annual request for moose numbers from trappers this year should request a similar breakdown of moose numbers.

It was a mistake not to collect jaws for aging our kill in 1956. The programme of aging the kill must be an accepted annual task. Our present concern over the calf population can only be verified or alleviated by aging the kill during the next four or five years.

APPENDIX A - States Contributing Hunters

Michigan	83
Ohio	22
Indiana	20
Georgia	2
Florida	1
Illinois	1
Missouri	1
New York	1
Pennsylvania	1
Wisconsin	1
Blind River (local address)	1
	134

APPENDIX B - Non-Resident Hunter Effort

62 successful hunters reported hunting a total of 347 days, or an average of 5.5 days per hunter.

55 unsuccessful hunters reported hunting a total of 403 days, or an average of 7.3 days per hunter.

Total man-days of hunting 750
Total moose killed 62

On an average, 12.1 days of hunting were required to kill one moose.

APPENDIX C - Temporal Distribution of Moose Kill by Non-Resident Hunters

		Bulls	Cow	Male Calf	Female Calf
October	13	4	2		
	14	1			
	15	3	1		
	16	3			
	17	4	1	1	
	18	1			
	19	1			
	20	1			
	21	3			
	22	2	2		
	23	1		1	
	24	2			
	25	1			
	26	1			
	27		2		
	28	1			
	29	2			
	30	1			
	31		2		
November	1				
	2		1		
	3				
	4				
	5	1			
	6	2	2		
	7	1			
	8				
	9	2	2		
	10	1			
	11	1	2		
	12		1		
	13				
	14		1		
	15				
		40	20	2	

APPENDIX D - Resident Hunter Effort

292 successful hunters report hunting a total of 1,385 days for an average of 4.8 per hunter.

996 unsuccessful hunters report hunting a total of 6,933 days, for an average of 6.9 days per hunter.

Total man days of hunting 8,318
Total moose killed 292

On an average, 28.5 days were required to kill one moose.

APPENDIX E - Temporal Distribution of Moose Kill by Resident Hunters.

		Bulls	Cows	Male Calves	Female Calves
October	13	13	5	2	
	14	4	2	1	1
	15	5	6	1	
	16	4	2		
	17	3		1	
	18	2	4		
	19		1		
	20	3	3	1	
	21	1	1		
	22	1	2		
	23	2			
	24	3			
	25		1		
	26	2	3		
	27	1	3	1	
	28	2	4	1	
	29	6	3		
	30		1		
	31	1	2		
TOTALS		53	43	8	1
November	1	2	3		
	2	1	2		
	3	2	6	1	
	4	2	1		
	5	1	1	1	1
	6	3	1		
	7				
	8		3	1	
	9				
	10	4		1	
	11	1			
	12	4	1	2	
	13		1	2	
	14	1	2		
	15	3	1	1	

	Bulls	Cows	Male Calves	Female Calves
November 16	1	2		
17	1	3	1	2
18	1		1	
19	3			
20	1	3		
21	2		1	
22		3		
23	3	2		
24	2	4	1	
25		3	1	
26	1	2		
27			1	1
28	1			
29	2	1		
30		3	1	
TOTALS	42	48	16	4
December 1	5	5	1	1
2	3	2		
3	2	2	2	1
4	1	3		
5			1	
6		1	1	
7	1			
8	1			
9	2		2	
10	2	1		
11	1			
12	1			
13		1		
14	2			
15		4		
16	1			
17	1			
18	2			
19	1	1		
20	3	8		1
21	1	1		
22	1	4	1	
23	1	1		
24				
TOTALS	32	34	8	3
GRAND TOTALS	127	125	32	8

APPENDIX F

Purpose

To analyse the methods used to procure returns from non-resident moose hunters following the open season of 1956.

Discussion

The season ended on November 15, 1956, and the first reminder went out on November 21, with subsequent letters on December 7, 1956, and January 3, 1957.

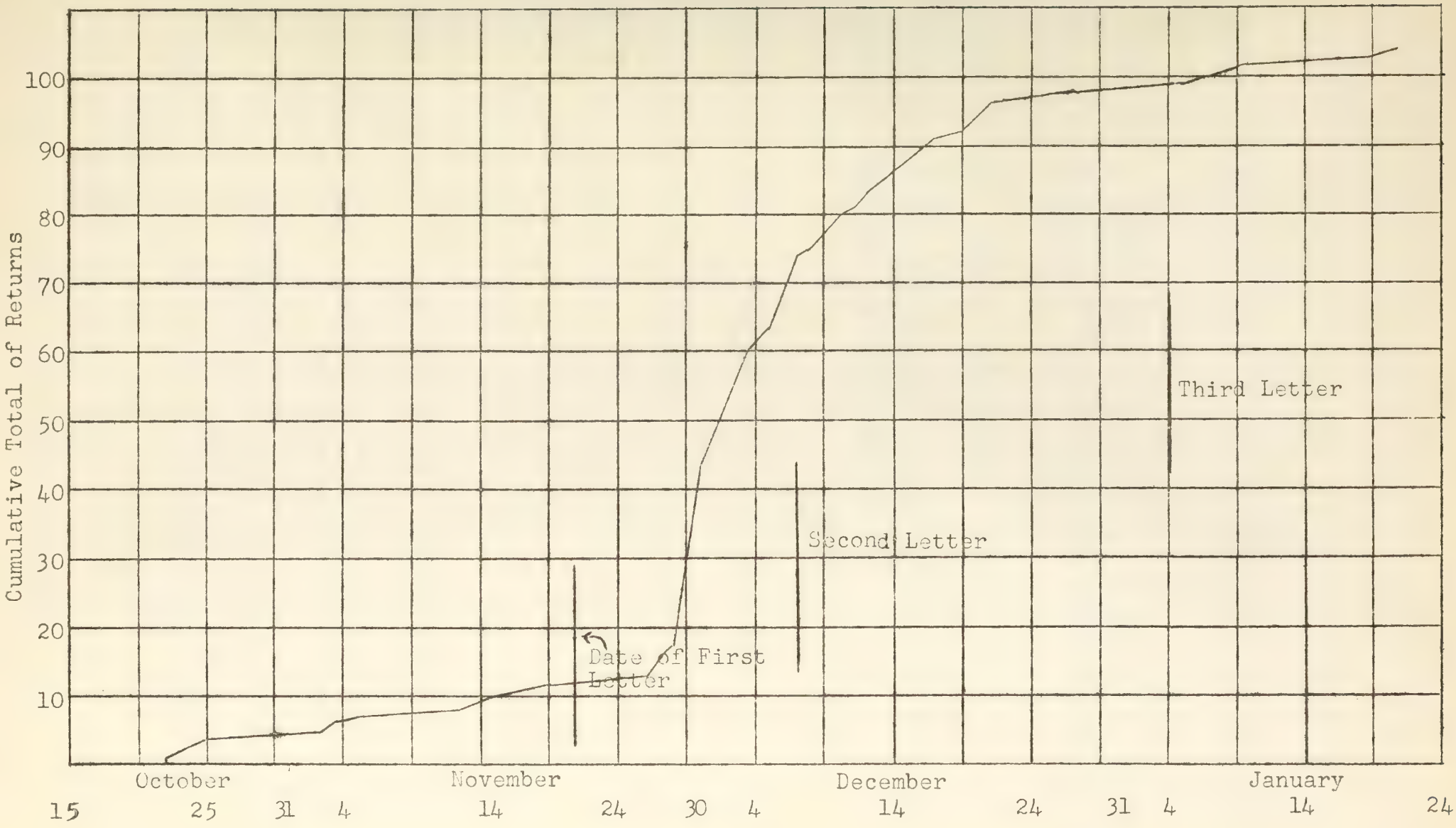
Of the 209 licenses sold in this District, 134 of the hunters are considered to have hunted in the Sault Ste. Marie District. However, this report will deal with returns from all hunters, rather than the smaller figure. By using the larger totals, it is felt that the picture shown will be more indicative of the true situation.

In graph No. 1, is shown the cumulative total of returns in the period October 15 to January 24. It is noted that the number of returns from the end of the season to November 28 was very light. It is evident that this period of time, almost two weeks, produced very little towards the collection of returns.

The timing of the second letter in relation to the first appears to have been almost perfect, as the high rate of returns was maintained.

The third letter, which went to 23 hunters, contributed very little in the way of returns, and it might be that it could be overlooked in another year.

GRAPH NO. 1


Cumulative Total of Returns
100
90
80
70
60
50
40
30
20
10
Third Letter
Second Letter
Date of First Letter
October
November
December
January
15
25
31
4
14
24
30
4
14
24
31
4
14
24

In graph No. 2 is shown the cumulative kill figures by sex, and the nil returns.

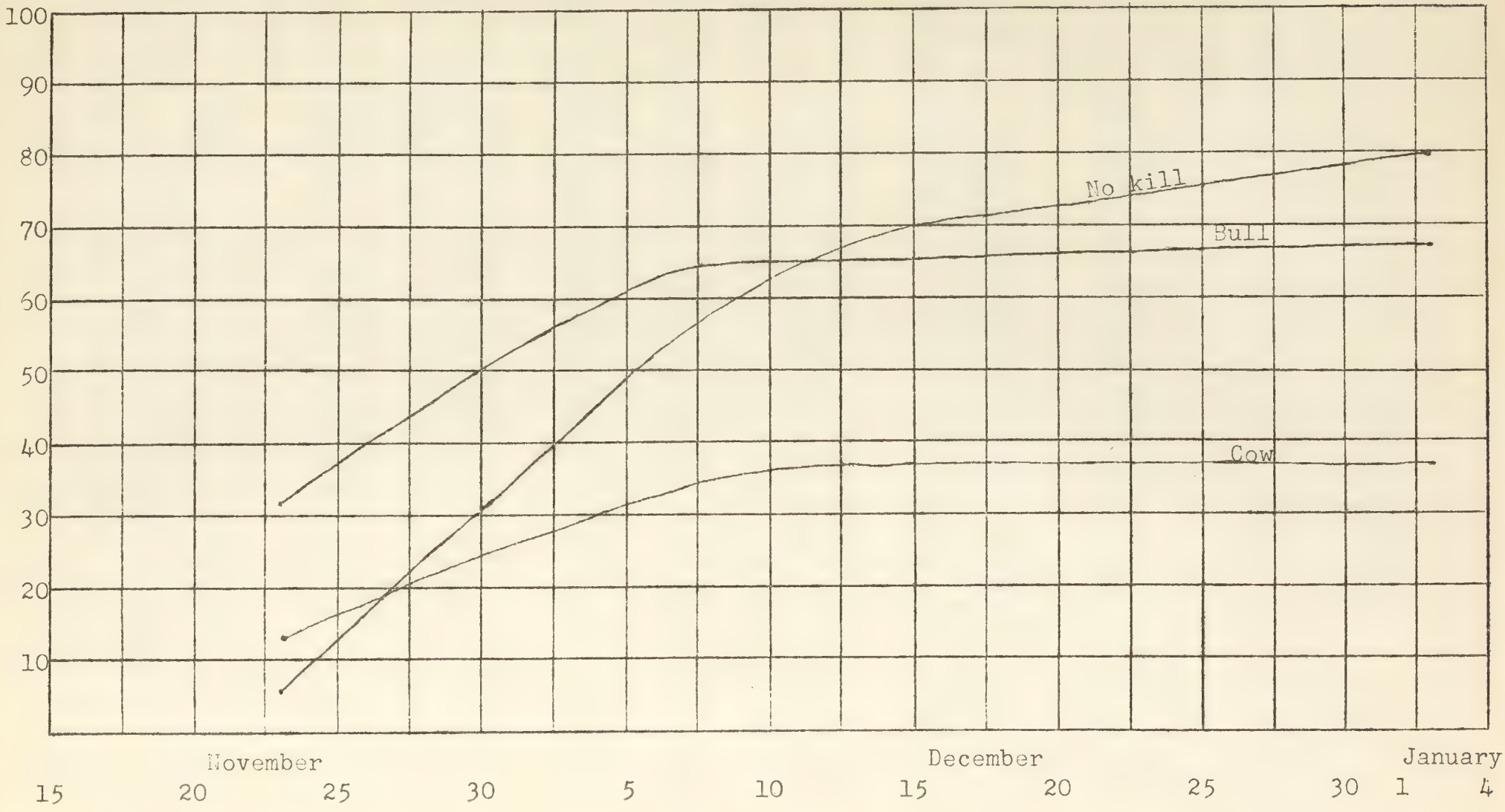
Recommendations

(1) It is felt that approximately one week before the end of the season would be the ideal time to send out the first reminder. By this time a good many of the hunters would have either completed their hunting, or made a decision against further hunting if they have not already been successful.

(2) It would appear that two subsequent letters should follow at approximately two-week intervals.

(3) The high rate of hunter success, as indicated by the low rate of returns from unsuccessful hunters, suggests that we should establish at least a six-week period from the end of the season before considering the survey finalized.

GRAPH NO. 2 - Kill of Moose By Sex and Number as Taken from Returns



APPENDIX G - Economic Survey of Non-resident Hunters

Total non-resident licenses sold	209
Number of questionnaires mailed	107
Number of questionnaires returned	77

Information

The 77 hunters report spending a total of 873 days away from home for hunting purposes. This average of 11.3 days per hunter indicates that for the most part the hunters availed themselves of either a two-week holiday period, or an extra long week-end and a week of holidays.

The table indicating hunter effort shows that the successful hunter spent 5.5 days hunting and the unsuccessful 7.3 days. When averaged, it would appear that all hunters spent approximately 6.4 days hunting, which would indicate that approximately 5 days were spent by each hunter for travelling, or other efforts not associated with hunting.

While away from home, 53 hunters reported travelling a total of 33,760 miles or an average of 637 miles per hunter. In addition to this mileage travelled, a good many hunters reported using other means of transportation such as private and commercial aircraft and railways.

The main item of cost for the non-resident hunter appears to be food and lodging. The 77 hunters reported spending a total of $9,125 or an average of $119.00 per hunter.

Included in this total figure and having the effect of lowering the average, are returns from more than a few hunters who stayed with friends, or at their private cabins, with lower expenses being the result.

The 77 hunters reported spending a total of $5,806. on guides for an average of $78.00 per hunter. Several hunters did not report any charges for guides, and it is assumed that their charges are included in the figures submitted by other hunters.

The amount of money spent by the 77 hunters for miscellaneous items total $4,584, or $68.00 per hunter. This amount was spent on such items as gas, oil, car repairs, etc.

Discussion

The amount of money spent on the three major items of expense total $265.00. The cost of a non-resident moose license ($101.00) should be added to this, giving an average total expenditure of slightly more than $350.00 per non-resident hunter. It is the opinion of everyone with whom this subject was discussed that this figure was definitely on the conservative side.

The hunter success for non-residents was approximately fifty percent.

Using the costs arrived at from this survey, would indicate that each moose killed in this part of Ontario by a non-resident represents a capital outlay of at least $700.00.

The accuracy of these statistics and the small sample, limit how far these results may be extended. However, for the purposes of indicating how information of this type can be of value, the following calculation is included.

Total monies spent by non-resident hunters in the Sault Ste. Marie District - 134 x 350 = $46,900.

Assume that five percent return on a capital investment is reasonable. This total expenditure can be considered as interest on a capital investment (i.e. total moose herd.)

Therefore, from a non-resident hunter's viewpoint, our moose herd represents a capital value of $938,000. or approximately one million dollars.

AERIAL MOOSE INVENTORY PORT ARTHUR DISTRICT, 1957 *

by
R. A. Ryder

A Regional Fish and Wildlife Meeting was held at Port Arthur on January 16, 1957 with the intent of adapting new aerial census methods to the Port Arthur and Geraldton Districts. At this meeting Mr. Lumsden and Dr. Fowle outlined the general plan for aerial censusing which proved to be so successful in the Gogama and White River Districts in 1956. It was stressed that deviations from the general method might be desirable to meet with the variation in conditions found in different districts.

Methods Employed

Arbitrarily, four sample plots were set up, three being located in a young, medium, and mature stand, the other in a new burn.

The areas of the selected plots were 50, 53, 67 and 64 square miles, respectively. An area of 50 square miles was thought to be about the maximum that could be effectively covered in one day's flying, and the sample plots were limited accordingly. Three of the sample areas included more than 50 square miles so more effective topographical boundaries could be established.

The four sample plots were flown once each between January 29 and February 4. Two observers and one navigator were used on every trip except one when the navigator had to substitute as an observer. One mile flight strips were employed. Each strip was flown at approximately an 800 foot altitude and an air speed of about 90 m.p.h. until moose tracks were observed. The immediate area around the moose tracks was then circled intensively until it was decided that all the moose in the vicinity were spotted. Flight lines were then resumed. The results of the first four flights using the strip method are summarized in the table below.

Age of Stand	Area Square Miles	Flight Time Over Plot (Hours)	Number of Moose Spotted
Young	50	2.0	7
Medium	53	1.3	1
Mature	67	1.8	8
New Burn	64	2.3	4

It appears obvious from perusing the above data that a complete count of all the moose was not obtained from the first four flights. This was attributed to two principal factors:

* A series of topographic maps showing plot locations accompanied the original report.

(1) A deficiency in the method employed.

(2) Sample plots too large to cover efficiently in available time.

It was found that after continuous observing on the plots for two hours, the efficiency of the observers declined as fatigue became more evident. This, coupled with the fact that a round trip flight of about two hours was necessary on two of the plots before observations began, resulted in a very tedious task. On February 5, after discussing our problems with Mr. Trotter of Sioux Lookout, we decided to modify our methods. An experimental flight was made with Mr. Trotter acting as navigator on a new plot selected close to the airbase. By circling a small area (roughly one square mile) intensively, a more thorough count was made. These small areas within the sample plot were determined by the navigator, depending on topographical boundaries and then circled both clockwise and counterclockwise until continued circling failed to reveal additional moose to the satisfaction of all observers. An arbitrary limit of 20 square miles was set up for the sample plots as it was found that a two hour flight could cover this area fairly intensively. As this method proved satisfactory, the former strip method was abandoned and three new plots were set up closer to the base of operations. These plots consisted of a young, medium, and a cut-over stand. In the latter the conifers were harvested leaving mature poplar and birch standing. Young poplar, birch and conifers were regenerating under the remaining older trees. The following table illustrates the moose counted to date on these three plots.

Age of Stand	Area (Sq. Miles)	Flight Time Over Plot (Hours)		Number of Moose Spotted	
		1st Flight	2nd Flight	1st Flight	2nd Flight
Young	20.0	2.9*	1.4	26*	27
Medium	20.5	1.7*	0.6	15*	16
Cut-over	15.2	1.2	1.3	11	13

* Segments of sample plot added together to obtain total

Up to the time of compiling this report a satisfactory mature stand had not been located. This was due to the dense upper story found in most mature stands in the district, preventing an accurate census where the ground could not be seen over large areas. In the future we plan to obtain track and scat counts on these areas and compare them to track and scat counts in areas where the moose density has already been established through aerial surveys. In this manner we hope to obtain a relative estimate of moose density in mature stands. From observations of our field men it is believed that the moose density on these mature stands is less than on any of the three other timber types surveyed.

Population Estimate

While it is rather premature at this point to attempt a population estimate of moose in the district, a preliminary estimate will be made until more complete data are available. Figures on moose per square mile obtained from the sample plots will be applied to the same timber type for the whole district. For our purposes the areas of the timber types within the district can be broken down as follows:

Mature (Over 60 years of age)	5,406 square miles
Medium (30 to 60 years old)	4,729 square miles
Young (Under 30 years of age)	3,379 square miles
Non-forested Land (Agricultural areas, water)	3,379 square miles
Total Area of District	16,893 square miles

Considering non-forested land as non-productive moose habitat, we come up with the following breakdown of timber types and the moose densities in each.

Timber Type	Area (Square Miles)	Calculated Moose Density (Per Square Mile)	Calculated Population
Mature	5406	0.25 **	1351.5
Medium	4729	0.78	3688.6
Young *	1759	1.35	2374.7
Cut-over	1620	0.86	1393.2
Estimated Moose Population			8808.0

x Includes burn-overs and blow-down but excludes cut-over areas.
xx Arbitrary figure assigned until more accurate estimate can be made.

Thus the estimated moose population as a whole (including non-productive habitat for moose) is roughly one moose for every two square miles or about 9,000 moose reducing the calculated estimate to significant figures. The density of moose on potential moose habitat only (mature, medium and young stands) and excluding agricultural land and water areas would be about one moose per each square mile and a half.

Cut-over areas (for the last twenty years) while actually young stands were considered separately because they differ from other types of young stands in that they are easily accessible. Consequently, the heaviest hunting pressure occurred on these areas. A significant difference on moose density showed up between the cut-over sample plot and the other young type sample plot which in this case was the result of an old burn. Moose densities of 1.35 and 0.86 moose per square miles were encountered on these plots respectively.

Trappers' Population Estimate

One hundred and twenty trappers in the district estimated a moose population of 1,570 moose on 4,860 square miles of trap line. As it is impractical to break down the individual trap lines into timber types, we must apply the trappers' estimate to the whole district. This gives us a density of about one moose per three square miles or 5,631 moose for the district estimate. This is about three-fifths of the estimate obtained by means of the aerial census method.

Observations and Conclusions

1. All Observers agreed that a dull day was preferable for moose spotting to a bright sunny day. On dull days the trees did not cast a shadow and moose observation was simplified. All the observers noted that they were efficient for a longer period on a dull day probably because of the reduced glare.

2. Early morning flying did not seem to produce as satisfactory results as midday flying. The period from about 11:00 a.m. to 1:00 p.m. seemed to be the preferred time.

3. Mature conifer stands were impossible to survey satisfactorily using the aerial method. As it was impossible to see the ground over large expanses it was likely that many moose would be missed.

4. The trappers in the district have probably been underestimating the number of moose found on their traplines rather than over-estimating them as was previously thought.

5. Young burn-over areas produce the best moose range in the district followed by young cut-over and medium types respectively. The status of mature stands in respect to moose is not definitely known although it is believed to support less moose than the three previously mentioned types.

6. The moose population in the Port Arthur District is about 9,000 moose or about one for every two square miles.

7. The aerial survey method as outlined previously has been the most satisfactory method employed in the Port Arthur District to date for moose census work.

Acknowledgments

Without the untiring efforts of Pilot Art Burtt, this moose inventory would not have been possible. Thanks are due to Bob Trotter, Fish and Wildlife Supervisor, Sioux Lookout, for the sound advice and time which he donated to this project. George Whitefield acted as navigator on most of the flights and D. D'Agostini, G. Manore, P. Nunan, A. Rettie, R. Ryder, L. Sleeman, T. Swift and R. Trotter served as observers.

H 37

Aerial Survey of Moose

Plot .....1..... Size ...20.0..... square miles
Location ....Onion Lake.....
Cover Type ..Young (Burn over 25 years).....
Pilot ..A. Burtt..... Navigator ....R. Trotter.....
Observers (right side) .....R. Ryder.....
(left side) .....G. Whitefield.....
Air Speed ...80 m.p.h..... Altitude .....800 feet.....
Date Covered .Feb. 6. 1957..... Noon Temperature .....-.....
Wind Direction .....-..... Wind Speed .....-.....
Cloud Cover ...Overcast..... Ceiling ...2500 feet.....
Snow Depth ..18.2". A.....
Amount of Snow since last snow fall .....
Days since last snow .....
Time of arrival over the plot .....10.35 a.m.....
Time survey completed on plot .....11.50 a.m.....
Number of Moose Seen .....21.....
Notes .....Portion of whole plot.....

Aerial Survey of Moose

Plot .....1..... Size ...20.0..... square miles
Location .....Onion Lake.....
Cover Type ...Young (Burn over 25 years).....
Pilot ...A. Burtt..... Navigator ..G. Whitefield.....
Observers (right side) ...E. J. Swift.....
(left side) ....P. Nunan.....
Air Speed ...90 m.p.h..... Altitude ...800 feet.....
Date Covered .Feb. 7/57..... Noon Temperature .....-.....
Wind Direction ..West..... Wind Speed .....-.....
Cloud Cover ...Nil..... Ceiling ....CAVU.....
Snow Depth .....18.2". A.....
Amount of Snow since last snow fall .....
Days since last snow .....
Time of Arrival over the plot .....11.15 a.m.....
Time survey completed on plot .....1.00 p.m.....
Number of Moose Seen .....7.....
Notes .....Portion of whole plot.....

H 37

Aerial Survey of Moose

Plot .....1..... Size ...20.0..... square miles
Location ....Onion Lake.....
Cover Type ..Young (Burn over 25 years).....
Pilot .....A. Burtt..... Navigator ..E. J. Swift.....
Observers (right side) ....C. Manore.....
(left side) .....P. Nunan.....
Air Speed ...80 m.p.h..... Altitude .....800 feet.....
Date Covered ..Feb. 11/57..... Noon Temperature ...+20° F.....
Wind Direction ...South..... Wind Speed ....12 m.p.h.....
Cloud Cover ...Overcast..... Ceiling ....2200'.....
Snow Depth .....18-24" A.....
Amount of snow since last snow fall .....
Days since last snow .....
Time of arrival over the plot ....10.30 a.m.....
Time survey completed on plot ....11.05 a.m.....
Number of Moose seen .....12.....
Notes ...Only a portion of the whole plot.....

Aerial Survey of Moose

Plot .....1..... Size ..20.0..... square miles
Location .....Onion Lake.....
Cover Type ....Young (Burn over 25 years).....
Pilot ....A. Burtt..... Navigator ....E. J. Swift.....
Observers (right side) .....D. D'Agostini.....
(left side) .....C. Manore.....
Air Speed ....80 m.p.h..... Altitude ....800 feet.....
Date Covered .Feb. 14/57..... Noon Temperature ...-10°F.....
Wind Direction .-..... Wind Speed .....-.....
Cloud Cover .Nil..... Ceiling ...CAVU.....
Snow Depth ...22.6" A.....
Amount of Snow since last snow fall ....2"-3".....
Days since last snow .....2 days.....
Time of arrival over the plot ....10:05 a.m.....
Time survey completed on plot ....11:30 a.m.....
Number of Moose seen .....27.....
Notes .....Whole plot done.....

H 37

Aerial Survey of Moose

Plot .....2..... Size .....15.2.....square miles
Location ...Abigogami Lake.....
Cover Type ..Cut-over (Conifers harvested leaving mature hardwoods.
..standing with young growth underneath).....
Pilot ....A. Burtt..... Navigator ...G. Whitefield.....
Observers (right side) ...E. J. Swift.....
(left side) ....R. A. Ryder.....
Air Speed ...90 m.p.h..... Altitude ....800 feet.....
Date Covered ..Feb. 18/57..... Noon Temperature ...0° F.....
Wind Direction ..South..... Wind Speed ..10 m.p.h.....
Cloud Cover ...Nil..... Ceiling .....CAVU.....
Snow Depth ...28.5" B.....
Amount of Snow since last snow fall .....
Days since last snow .....
Time of arrival over the plot .....11.25 a.m.....
Time survey completed on plot .....12.45 p.m.....
Number of Moose seen .....11.....
Notes ..All moose spotted appeared to be feeding on the tops of....
..ridges.....

Aerial Survey of Moose

Plot .....2..... Size ....15.2.....square miles
Location ...Abigogami Lake.....
Cover Type .Cut-over (Conifers harvested leaving mature hardwoods..
.standing with young growth beneath).....
Pilot ..A. Burtt..... Navigator ..G. Whitefield.....
Observers (right side) ....W. Sleeman.....
(left side) .....A. Rettie..... .....
Air Speed ..85 m.p.h..... Altitude ..800 feet.....
Date Covered .Feb. 19/57..... Noon Temperature ...+20°F.....
Wind Direction ...East..... Wind Speed ..7 m.p.h.....
Cloud Cover ...Overcast..... Ceiling .....2500.....
Snow Depth .....28.5" B.....
Amount of Snow since last snow fall .....
Days since last snow .....
Time of Arrival over the plot ....1130.....
Time survey completed on plot ....1250.....
Number of Moose Seen .....13.....
Notes .....Visibility good.....

H 37

Aerial Survey of Moose

Plot .....3..... Size ....20.5..... square miles
Location .....Dog Lake.....
Cover Type .Medium Stand (mixed hardwoods and conifers).....
Pilot ...A. Burtt..... Navigator ...G. Whitefield.....
Observers (right side) ....P. Nunan.....
(left side) ....E. J. Swift.....
Air Speed ...90 m.p.h..... Altitude ...800 feet.....
Date Covered ..Feb. 22/57..... Noon Temperature ....+5°F.....
Wind Direction ..West..... Wind Speed ....20 m.p.h.....
Cloud Cover ...Nil..... Ceiling ...CAVU.....
Snow Depth ...22.6". A.....
Amount of Snow since last snow fall .....
Days since last snow .....
Time of arrival over the plot .....1.50 p.m.....
Time survey completed on plot .....3.25 p.m.....
Number of Moose seen .....8.....
Notes .....Only a portion of the whole plot.....

Aerial Survey of Moose

Plot .....3..... Size ...20.5.....square miles
Location ....Dog Lake.....
Cover Type .Medium Stand (mixed hardwoods and conifers).....
Pilot .....A. Burtt..... Navigator ...G. Whitefield.....
Observers (right side) ...E. J. Swift.....
(left side) ....P. Nunan.....
Air Speed ...90 m.p.h..... Altitude ...800 feet.....
Date Covered ..Feb. 27/57..... Noon Temperature ...+5°F.....
Wind Direction ..West..... Wind Speed ...12 m.p.h.....
Cloud Cover ..Nil..... Ceiling .....CAVU.....
Snow Depth ...21.7". A.....
Amount of Snow since last snow fall .....
Days since last snow .....
Time of arrival over the plot ....11.50 a.m.....
Time survey completed on plot ....12.30 p.m.....
Number of moose seen .....16 (whole plot).....
Notes .....

AERIAL MOOSE SURVEY, SIOUX LOOKOUT DISTRICT, MARCH, 1957.*

by
R. H. Trotter

(1) General Remarks

The survey was started January 23rd and the eighth plot was completed on February 14th. A recheck was made of plot seven on February 20th.. All flying since that date has been on the cross country flight lines mapping in moose concentrations and a survey of the Caribou Crown Game Preserve. A total of 248 moose, 18 caribou and 25 deer were observed over the plots which range in size from 16 to 60 square miles, totalling approximately 264 square miles.

At the start of the survey in January, with about 20 inches of snow on the ground and fresh snow partially covering the old tracks, conditions were fairly good, but by February 14th with very little added snow, it was becoming difficult to tell fresh tracks from old ones.

The weather was clear and cold most of the time, ranging from zero to -20°F.

We had some trouble keeping the windows clear on frosty mornings but by noon they were always clear, frost scrapers were used when necessary. Some type of hot air window defrosters should be installed in aircraft used for this type of work. The suggestion from Gogama of turning the heat down and opening the vents is just too uncomfortable, the crew lose interest when they get cold and when that happens you may as well go back to base. The frost shields suggested by Geraldton District may be O.K. if they are large enough to allow for a good range of vision from different angles. We have them on the otter but they seem to cut down the area of vision and when the windows clear off the black edge of the frost shield is distracting to the observer.

Method Used

The original method of drawing flight lines on the plot map and covering the area on each line over the plot was abandoned in favour of a block in method whereby we do a small section of the plot at a time. When we feel that all the moose in this block have been counted the area is coloured in and another block marked out, the same procedure is continued over the entire plot, or till it is time to quit. We have decided on plots which can be finished in one day.

* A series of topographic maps showing plot locations accompanied the original report.

This allows for less error in recounts, especially if the snow is not too deep and the moose are wandering around a lot. The plots should not be over 40 square miles and the blocks within the plot previously mentioned, range in size from one to two square miles depending on the topography of the area. Streams, lakes, timber types, roads, ravines, ridges etcetera are used as outside boundaries for the blocks. These are generally flown from the outside in, on the pilot's side to the center, then reversing and circling from the inside out, on the navigator's side. This gives the observer on the top side a chance to relax while the low side looks it over and allows for a double check on the entire area. A good average height seems to be around seven hundred feet. We often fly lower but very seldom higher. If a plot falls in rough terrain where hills are high and there are deep ravines another location should be picked for two reasons, first as a safety precaution and secondly because moose are too hard to count in such an area.

Population Density

A number of flight lines from the base to the various plots have been flown at 800 feet. All moose concentrations were noted and plotted on the map as to track density. This gives us a general picture of the moose range in the hunted part of our District. We find that after a couple of weeks of this work one can be quite sure of the moose density just by comparing the track concentrations mentally, to those which were observed over the plots where the actual moose count took place. All moose, deer, caribou and wolves observed along the flight lines were also recorded on the map.

The more time we spend on these low level flight lines across country recording moose and concentration areas, the more I am convinced that it is a very essential part of our moose inventory. It is the only way to get a complete picture of the whole area and I believe an experienced crew can say without any hestitation when they are flying over an area that is supporting over a moose per square mile. We have double checked this by recording from the observers as they crossed plots of known density on the flight lines. There was no way for the observers to know when they are crossing these areas and yet when density maps are compared later, they have always corresponded where the flight lines crossed the plots. That is to the extent of whether the population is over or under one moose per square mile.

Habitat

Evergreen stands take longer to check than deciduous stands and we are still not sure what percentage of the moose in such areas can be counted. If the animals stand still or are lying down in these stands, it takes a very sharp eye to spot them. The population is lower in most of these stands because there is a shortage of preferred food. However they offer excellent cover so that if the stand is close to a feeding ground such as an old burn, cut over or blow down that has rotted, we must assume that a large percentage of the animals using this feeding ground could be in the evergreen stand when they are not feeding.

Our highest moose concentrations were found in cut over areas, with burned areas second, young mixed stands third, deciduous stands fourth, with mature evergreen stands supporting the least number of moose probably because of the shortage of preferred foods where the crown density is such that the light can not penetrate to the ground.

There is little or no new growth and no food for the animals. Any moose found in these areas are just passing through in search of new feeding grounds. We have recorded moose densities in cut over areas over two animals per square mile, with burned over areas up to one and one-half per square mile and mixed up to one per square mile. Other stands vary from nothing to one animal per two or three square miles.

Habits

The moose observed to date do not appear to have any definite time for feeding or sleeping as we have noted some lying down and some feeding in the same plot at any time of the day. Some run when the aircraft flies low over them, and some never stop eating, some will get up and others in the same area will lie in their beds, not paying any attention to the aircraft. At least a dozen moose were observed still carrying their antlers in February. It was noted that in cut over areas moose preferred to use the old draw roads to travel on rather than wander aimlessly through the woods, when going to a new feeding ground.

Conclusions

We feel that the method used for censusing moose from the air has been successful and that it should be continued each year over most of the same plots and some additional ones.

A browse survey should be attempted on some of the plots where the moose density is highest to try and determine what the carrying capacity of the range is.

We feel that we have a moose per square mile in most of our hunted areas.

Of the eight plots checked, No. 7 could be called a failure and No. 6 a poor count. However, the survey on the other six plots was a success and we hope to do Plot No. 6 over again this winter.

Based on my observations here and at Gogama, I believe that, where moose are plentiful, a higher percentage of the animals can be counted from the air. The main reason for this is over browsing, food is not readily available, so the animals have to spend more time on the move searching for it. In the less heavily populated areas the food is usually available and they spend more time lying down.

I have noticed that in nearly all of the high concentration areas moose have been standing or walking. The feeding ground is usually quite open and if the animals are up around there is no trouble spotting them.

More cross country flight lines should be mapped but we probably won't get much more done on it this winter.

No. 1 Plot

Three flights have been made over the area consisting of a preliminary flight to establish boundaries and two flights of approximately three hours each, to count the moose.

The plot was flown by circling the outer edge and gradually working in to finish in the center. All the cut over and most of the mixed stands were on the outer part of the plot, with the center almost completely covered by dense stands of spruce and jack pine. By starting on the outside, we were working the best area the first day spotting a total of 33 moose. On the second day only 13 were noted. The reason for the low count on the 25th was the high percentage of dense evergreen stands which had to be covered.

The total count for this plot was 46 moose but we feel sure there was over a moose per square mile on the plot.

There is a lumbering operation going on at the north end of the plot but it does not seem to be bothering the moose any as there was no noticeable difference in the tally in that area.

This plot was picked because it is in a heavily hunted area. With the Red Lake Road as the East boundary, it is easily accessible to hunters. If it could be checked thoroughly each winter we could probably get some valuable information pertaining to the effect of hunting pressure on the moose population.

We plan to recheck at least part of this plot and probably change the boundaries to cut down the size to where it can be checked in one days flying.

Sioux Lookout, Ontario

Date January 24, 1957

H 37
Aerial Survey of Moose

Plot No. 1 Flight No. 1 Size 60 square miles
Location Aerobus Lake
Cover Type mixed and cut over Jackpine and Spruce predominating
Pilot H. Speight Navigator R. H. Trotter
Observers (right side) Nil
(left side) E. Stone
Date covered January 24, 1957 Noon temperature 16 below
Wind direction W Wind speed 10 m.p.h.
Cloud cover Nil Altitude 800 feet
Snow depth 21"
Days since last snow 2 days
Time of arrival over the plot 11:15 a.m.
Time survey completed on plot 2:50 p.m.
Number of Moose seen 33
Notes: About half of the plot completed. There seemed to be as many moose lying down in the afternoon as the a.m. Quite a number of deer were noted and the tracks were confusing in dense stands. No Caribou were noted today. Moose yards were recorded on flight line from Sioux to the plot.

Sioux Lookout, Ontario

Date January 25th, 1957

H 37
Aerial Survey of Moose

Plot No. 1 Flight 2 Size 60 square miles
Location Aerobus Lake
Cover Type Spruce, Jackpine, Aspen and cut over areas
Pilot Harry Speight Navigator R. H. Trotter
Observers (right side) Nil
(left side) Earl Stone
Date covered January 25, 1957 Noon temperature 20 below
Wind direction W. 12 m.p.h. Wind speed 12 m.p.h.
Cloud cover Nil Altitude 800 feet
Snow depth 21 inches
Days since last snow 3
Time of arrival over the plot 10:45
Time survey completed on plot 2:35
Number of Moose seen 13
Notes: Nine of the moose were lying down. Today's flight was over the center of the plot where the timber is heaviest. This probably accounts for the low tally. Fourteen deer were spotted, this concluded No. 2 plot with a total of 46 moose. We feel sure there are over 60 on the plot. A total of 26 deer were also noted. No caribou.

Sioux Lookout, Ontario

Date ..February.7..1957.....

H 37
Aerial Survey of Moose

Plot .....2..... Size .....40.....square miles
Location .Whitemud.Lake.....
Cover Type ...Mixed.(poplar..Jackpine.and.spruce).....
Pilot ...H..Speight..... Navigator ...E..H..Stone.....
Observers (right side) .....
(left side) .....J..A..Shannon.....
Date covered .February.7th...1957 Noon temperature ...-5°.....
Wind direction ..WNW..... Wind speed ....15.m.p.h.....
Cloud cover ..Nil..... Altitude .....800'.....
Snow depth .....23.inches.....
Days since last snow ....1.day.....
Time of arrival over the plot .10:35....) 1 hour stop for lunch
Time survey completed on plot .15:00....)
Number of moose seen .....38.....
Notes: Weather.was.slightly.warmer.than.previous.flights.and.moose.
seemed.to.be.moving.around.more...No.deer.or.caribou.....
observed...Most.moose.counted.were.observed.close.to.lakes..
within.plot.where.more.open.areas.were.located...The.....
extreme.north.and.south.ends.of.plot.were.fairly.heavy.....
spruce.and.it.was.difficult.to.observe.any.moose...Between..
Whitemud.and.Ogani.Lakes.there.was.a.heavy.stand.of.jackpine
which.made.observations.difficult.....

Sioux Lookout, Ontario

Date ...February.8th..1957.....

H 37
Aerial Survey of Moose

Plot .....3..... Size ....20.....square miles
Location .....Cedar.Lake,.Ont.....
Cover Type ....Cut.over.and.mixed.....
Pilot ..Harry.Speight..... Navigator ..R..H..Trotter.....
Observers (right side) ...J..A..Shannon.....
(left side) ...E..H..Stone.....
Date covered .February.8th..... Noon temperature .....24.....
Wind direction ...South..... Wind speed ...10.m.p.h.....
Cloud cover ..Nil..... Altitude .....Low.....
Snow depth ....22.inches.....
Days since last snow .....2.....
Time of arrival over the plot ....14:45.....
Time survey completed on plot ....17:45.....
Number of Moose seen .....21.....
Notes: There.is.a.lumber.camp.on.the.north.boundary.of.this.plot...
and.men.cutting.pulp.in.the.area..the.moose.seemed.to.be....
used.to.noise.and.were.hard.to.disturb..even.when.we.flew...
low.over.them...Most.of.the.moose.were.lying.down..one.....
young.Bull.still.had.his.antlers.....

Sioux Lookout, Ontario

Date ..January 31,.1957.....

H 37
Aerial Survey of Moose

Plot .....4..... Size .....36..... square miles
Location ....Highstone Lake, Ontario.....
Cover Type ..Burned over.....
Pilot .....J. Culliton..... Navigator ..R. H. Trotter.....
Observers (right side) .....John Shannon.....
(left side) .....Earl Stone.....
Date covered .January 31st, 1957. Noon temperature ...-6.....
Wind direction .North..... Wind speed ...3 m.p.h.....
Cloud cover ...Nil..... Altitude .....800.....
Snow depth .....21 inches.....
Days since last snow .....3.....
Time of arrival over the plot .....1100.....1410.....
Time survey completed on plot .....1230.....1635.....
Number of Moose seen .....50.....
Notes: This a good feeding ground with very little cover 1938 burn. Moose were easy to spot.....

Sioux Lookout, Ontario

Date ..February 1st, 1957.....

H 37
Aerial Survey of Moose

Plot ..No. 5..... Size ...20..... square miles
Location ...Badshot Lake, Ont.....
Cover Type ....Cut over mixed Poplar, Spruce, Jackpine.....
Pilot ..J. Culliton..... Navigator ...R. H. Trotter.....
Observers (right side) ....John Shannon.....
(left side) .....Earl Stone.....
Date covered .Feb. 1st, 1957..... Noon temperature ...-5.....
Wind direction .West..... Wind speed ....8 m.p.h.....
Cloud cover ..Nil..... Altitude ...800.....
Snow depth .....21.....
Days since last snow ....4.....
Time of arrival over the plot ...1345.....
Time survey completed on plot ...1600.....
Number of Moose seen .....21.....
Notes: No. moose were observed in the cut over area - the highest concentration was along the edge of the cut over area. 7 of the 21 moose observed were lying down, we feel that about 85% of the moose on this plot were spotted.....

Sioux Lookout, Ontario

Date ..February.12th...1957.....

H 37
Aerial Survey of Moose

Plot ..6..... Size .....28..... square miles
Location ...Savant.Lake.Road.....
Cover Type ..Mixed.and.cut.over.....
Pilot ..H..Speight..... Navigator ..R..H..Trotter.....
Observers (right side)...J..Shannon.....
(left side) ...E..Stone.....
Date covered .February.12th...1957 Noon temperature ...30.above.....
Wind direction ...N.W..... Wind speed ...11.m.p.h.....
Cloud cover ..Nil..... Altitude ...800.....
Snow depth ..23.inches.....
Days since last snow .....1.(trace).....
Time of arrival over the plot ...1350.....
Time survey completed on plot ...1515.....
Number of Moose seen .....8.....
Notes: Moose.were.hard.to.see.as.there.were.a.lot.of.evergreens....
small.evergreens..the.moose.would.not.move..less.than.half..
the.moose.were.spotted...The.size.of.the.plot.was.limited...
because.of.crown.density...A.low.level.strip.cruise.was.....
flown.on.the.return.trip.to.Sioux.Lookout..and.all.moose....
concentrations.were.tallied.on.the.map.....

H 37
Aerial Survey of Moose

Plot Name ..Hamilton.Lake.7..... Size ....16..... square miles
Location ..Hamilton.Lake.....
FRI Cover Type ..Mixed.....
Notes on Ground Cover ...heavy.undergrowth.....
Crew Pilot ..H..Speight..... Navigator ...R..H..Trotter.....
Observer right side ..J..A..Shannon.....
Observer left side ...E..H..Stone.....
Air Speed ...95.m.p.h..... Flight Altitude ....800.....
Date .....February.13th...1957.....
Time of Arrival Over Plot .....1045.....
Time Survey Completed .....1530.....
Temperature on Plot ...12.above... Snow Depth of Plot .23.inches...
Days since last snow .1.(trace)... Amount Falling .....
Crust Condition ....nil.....
Wind Speed ..3.m.p.h..... Wind Direction ...N.W.....
Cloud Cover ..nil..... Ceiling .....nil.....
Visibility Conditions ..CAVU.....
Number of Moose Seen .....3.....
Notes: This.a.very.hard.plot.to.count.moose.on.because.of.the.heavy
undergrowth.which.covers.a.lot.of.the.area..the.figure.....
of.three.moose.is.not.close.to.the.correct.number.of.moose..
present.on.the.plot...There.were.plenty.of.tracks.....

Plot No. 7

This plot is situated near Hamilton Lake and comprises an area of approximately 16 square miles. About one-third of the plot had been burned over about 20 years ago and the rest runs heavy to spruce and jackpine with some mixed stands.

The first time this plot was surveyed on February 13th only three moose were recorded, quite a number of tracks were noted and it was felt by the crew that there were at least ten moose on the plot.

On February 20th two days after a heavy snow storm when conditions were ideal for this work the plot was again surveyed, this time four moose were recorded. Fresh moose tracks in isolated areas indicated that there were at least nine moose on the plot, this would be about one moose per two square miles.

There was too much heavy cover to allow accurate counting, but we hadn't much choice of plots in that area. The plot was established because it was desirous to have a sample plot close to the Savant Lake road and the plot was as good or better than most of the area along the road for observing moose from the air.

The crew feels sure that there is a moose per two square miles on this plot.

H 37
Aerial Survey of Moose

Plot Name .....7..... Size .....16..... square miles
Location ..Hamilton Lake.....
FRI Cover Type ..mixed heavy evergreen some burn.....
Notes on Ground Cover .....
Crew Pilot ..H. Speight..... Navigator ....R. H. Trotter.....
Observer Right Side .....J. A. Shannon.....
Observer Left Side .....E. H. Stone.....
Air Speed ..... Flight Altitude ...800.....
Date .....February 20th, 1957.....
Time of Arrival Over Plot ....1230.....
Time Survey Completed .....1415.....
Temperature on Plot ..... Snow Depth on Plot .....
Days Since Last Snow .....3..... Amount Falling .....
Crust Condition .....
Wind Speed .....3 m.p.h..... Wind Direction ..S. W.....
Cloud Cover ..... Ceiling .....
Visibility Conditions .....
Number of Moose Seen .....4.....
Notes: Second flight over this plot to try and count the moose but they feed in areas where it is too dense to see through..... from fresh tracks in isolated pockets - we estimate there... are eight to 10 moose on the plot...About one moose per two square miles.....

H 37
Aerial Survey of Moose

Plot Name ...8..... Size .....28..... square miles
Location ..Kapaka Lake (South of Armstrong).....
FRI Cover Type ..Cut over.....
Notes on Ground Cover .....
Crew Pilot ..H. Speight..... Navigator ..R. H. Trotter.....
Observer Right Side ..J. A. Shannon.....
Observer Left Side ...E. H. Stone.....
Air Speed ..... Flight Altitude .....800.....
Date .....February 14th...1957.....
Time of Arrival Over Plot ....1100.....
Time Survey Completed .....1530.....
Temperature on Plot ..10 above.... Snow Depth on Plot ..25 inches...
Days since last snow ...1..... Amount Falling .....
Crust Condition .....
Wind Speed ...12 m.p.h..... Wind Direction .....S.....
Cloud Cover ..... Ceiling .....
Visibility Conditions .....
Number of Moose Seen .....60.....
Notes: The moose were all standing and easily spotted in cut over areas...8 moose were noted walking on old draw roads flight lines from Sioux Lookout to Lake Nipigon south and north... of the main C.N.R. line were flown...All concentrations of moose were recorded..we estimate an 80% count of moose on... the plot.....

General remarks

Moose March 14, 1957

The last three flights, all since the first of March, show a marked decrease in the number of moose feeding during the day.

The number bedded down is about double what it was a month ago when the weather was -20°.

Moose are much harder to locate on the plots this month and out line counts are down because of this change in feeding habits.

It could be that a much greater quantity of food is necessary for survival during the sub zero weather and the moose are forced to move around more in search of food. Or perhaps the warm sun makes them lazy in the daytime, so they sleep and do their feeding at night when it is too cold to lie around. There could be a number of reasons for the change in feeding habits but one thing seems certain, that is that it happened when the temperature came up and around 20 above.

This change has been noted on two different plots, on the flight lines and on a high concentration area where we intended

taking some aerial photographs. On March 11th we flew to the high concentration area to get some pictures and found that where we counted 21 moose feeding in a cut over area in February there wasn't a single moose feeding. The moose were still in the area, because twelve were spotted, but they were all lying down except one.

The snow is getting sticky now and sometimes we have trouble taking off with the extra gas load which we carry in drums for refueling on long trips. We may not get much more moose survey work done, but we will be keeping records on the feeding habits as long as possible this spring.

Caribou

This warm weather seems to be affecting the caribou the same way as the moose, the only difference being where they lie down. The moose bed down right where they are feeding but the caribou generally go out on a lake to lie down, as a result we are seeing more caribou and fewer moose.

Wolves

There is more evidence of wolves now than there was a month ago, possibly because they are keeping to the waterways more to avoid travelling through the deep, loose snow in the woods. It could also be the instinct to kill which seems more prevalent in the spring than during the winter months. When the first crust comes, everything will be in the wolves favour and they can satisfy their instinct to stockpile food for the young which will be born when food is harder to get. This too could have a bearing on the instinct of the moose and caribou. Perhaps they sense this and sleep in the daytime when there is less danger of predators bothering them.

Plot No. 9

This plot is situated 130 miles north of Sioux Lookout just south of the 11th baseline and east of the sixth meridian on the north shore of Upper Goose Lake.

The area was burned over some years ago, probably around 1936 and now produces ideal food and cover for moose.

The general appearance of the terrain would suggest an abundance of aquatic vegetation for the summer food supply of moose.

This plot was decided on because of a known population density of over three moose per square mile, eight on February 16th., 1950. This information was volunteered by two Department pilots, Harry Speight and J. Culletin.

The figures from todays flight over the area, though still high are not as high as they were in 1950.

At that time 36 moose were spotted in ten minutes flying over the area where we have established plot no. 9. On today's flight we spent one hour circling the area and counted 34. About ten square miles were sampled so we still have over three moose per square mile. However, the population density must have been much

higherin the winter of 1950 to allow the pilots to see so many moose in 10 minutes.

One hour was spent on snowshoes in the feeding area checking the browse but the snow was so loose and deep that the snowshoes sank down about a foot and very little ground was covered.

The area appears to have been over-browsed about four or five years ago and a lot of young trees have died from being cropped too close, white birch was the most noticeable, with trembling aspen second. There was heavy browse on the willow but it had survived. The last three years browse, though severe does not seem to be as heavy as the previous years.

The foregoing browse data are based on my personal observations and are by no means complete.

This plot is not accessible to white hunters and there is little or no Indian hunting pressure in the area. So that this particular pocket of moose, to the best of our knowledge, has been undisturbed by man.

It would be interesting to do more work on the area, to try and determine what happened to the moose population of 1950, and all the reproduction since that date. Perhaps the surplus has migrated out of the area but it is not likely because of the ideal conditions which exist on the plot. Perhaps reproduction fell off because of competition for food. Perhaps disease wiped out most of the herd a few years ago and the population is on the up trend now.

Regardless of the reason for the population slump, it would be a very worthwhile sample plot for work such as browse survey and a summer survey to determine the rate of reproduction. It might also be a good spot to do a little research work this fall. Perhaps a few animals should be checked for stomach content, disease and age.

H 37
Aerial Survey of Moose

Plot Name ...No..9..... Size .....10..... square miles
Location ....Upper.Goose.Lake.....
FRI Cover Type .....
Notes on Ground Cover ..Old.burn.about.1936...Regeneration.W..birch
..poplar..jackpine..spruce..willows..alder...
..dogwood.....

Crew Pilot ..H..Speight..... Navigator .....R..H..Trotter....
Observer Right Side ....John.Shannon.....
Observer Left Side .....Earl.Stone.....
Air Speed ..95.m.p.h..... Flight Altitude .500.to.600.ft..
Date .....March.13th...1957.....
Take off on strip ...10.30.....
Time of Arrival over plot .....1.30.....
Time Survey completed .....2.15.....
Strips completed .....4.15.....
Temperature on plot ..20.above... Snow Depth on Plot .26.inches...
Days since last snow ...1..... Amount Falling .....nil.....
Crust condition .....nil.....
Wind Speed ..5.m.p.h..... Wind Direction ..north.west.....
Cloud Cover .....nil..... Ceiling ....nil.....
Visibility Conditions ..CAVU.....
Number of Moose seen ...on.plot.34.....
Notes: On.flight.lines.16.total.moose.spotted.-.50...One.wolf.was.
spotted.on.Upper.Goose.Lake.in.sight.of.the.plot.and.two...
on.the.way.home.on.Fly.Lake...Wolf.tracks.were.also.noted..
on.Jeanette.Lake.and.Brokenmouth.River...No.kills.were.....
observed...Six.caribou.were.spotted.just.north.of.Lac.Seul.
on.the.way.home...Moose.were.not.moving..over.two.thirds...
were.lying.down.....

GAME INVENTORY OF THE CARIBOU CROWN GAME PRESERVE, 1957*

by
R. H. Trotter

Flight No. 2, February 22, 1957

This was the second successive day over the Game Preserve, it was colder with more wind than the first day, but we saw more moose. There was ice haze in the air both days but to-day it was so thick in some spots that it was impossible to see tracks from the air.

It was about -15° in the air and -11° on the ground. The observers in the back of the aircraft could not keep warm with full heat on, so they wrapped up in blankets. The windows frosted a bit but we managed to keep them clean by rubbing them with a coarse cloth and using ice scrapers when it got thick.

Thirteen caribou were spotted on a ridge just north of Cliff Lake and about five miles west of the Red Lake Road on the flight line to the Game Preserve two caribou yards were noted on the north edge of the Game Preserve near Optic Lake but we could not see the caribou. We estimated the herd to be about five in one yard and eight in the other. These are probably the same animals which the prospector told us about yesterday.

There were less deer yards on to-day's plot. A total of 11 deer were recorded with three of these off the plot. All deer recorded to date in the Game Preserve have been on the south half. Deer are harder to spot from the air than moose and the percentage of animals counted is much lower than in moose or caribou. The caribou are easy to count when you find them, because they are generally in a herd. We seldom note more than two deer in a place and their colour and size make it hard to spot them. The black hair on the moose stands out against the white background of snow and is seldom confused with other objects even in coniferous stands.

The total number of moose recorded to-day was 110 animals, 86 of which were observed in the Game Preserve. This is our highest count of moose for any one day. As in yesterdays flight the lines were two miles apart running north and south, the only time we did any circling was when over an area where moose were concentrated and orbiting became necessary to make the count. The highest concentrations of animals were from Sydney Lake south.

All information is being recorded on topographic maps and will be included in the final report.

* A topographic map showing recorded information accompanied the original report.

Sioux Lookout, Ontario

Date ..February.21st..1957.....

H 37
Aerial Survey of Moose

Plot .Crown.Game.Preserve.... Size .....58..... square miles
Location .....L.....
Cover Type .....
Pilot ..Harry.Speight..... Navigator ...R..H..Trotter.....
Observers (right side) ....J..Shannon.....
(left side) .....E..H..Stone.....
Date covered ..February.22nd..... Noon temperature ...-1.....
Wind direction .....W..... Wind speed ....5.m.p.h.....
Cloud cover ..Nil..... Altitude ....500.feet.....
Snow depth ...26.2.....
Days since last snow .....
Time of take off .....10.35.....
Time survey on plot ..2.hours..40.minutes.over.plot.....
Number of Moose seen ...80..... Flying time ...4.40.....
Home Base .....16.10.hours.....
Notes: .16.moose.and.5.deer.on.way.to.Game.Preserve.....
.13.moose.and.1.deer.on.return.trip.....
.51.moose.and.15.deer.in.the.game.preserve.-.all.flying.was.
.done.in.straight.lines.two.miles.apart.over.the.Game.....
.Preserve...The.only.circling.was.made.to.check.the.number..
.of.moose.spotted.where.moose.were.hard.to.see.....

Sioux Lookout, Ontario

Date ..February.22nd..1957.....

H 37
Aerial Survey of Moose

Plot .Caribou.Crown.Game.Preserve. Size..... square miles
Location ...Sydney.Lake.....
Cover Type ...mixed.burned.over.evergreen.....
Pilot .....H..Speight..... Navigator ....R..H..Trotter.....
Observers (right side) .....John.Shannon.....
(left side) .....E..Stone.....
Date covered ..Feb..22..1957..... Noon temperature ..-10.....
Wind direction ..West..... Wind speed ...6.m.p.h.....
Cloud cover ...frost.haze..... Altitude ...500.feet.....
Snow depth .....27.inches.....
Days since last snow .....5.....
Take off .....10.15.....
Time of arrival over the plot .....
Time completed ...17.00.hours.....
Total ...5.3/4.hours.flying.time.....
Number of Moose seen ....108.....
Notes .86.moose.were.observed.in.2.3/4.hours.flying.straight.lines..
.two.miles.apart.over.the.Game.Preserve..the.other.24.moose...
.were.observed.on.the.flight.lines.going.to.and.from.the.plot.
.13.Caribou.and.11.deer.were.also.observed.....

Date .February.21st,.1957. Flight No. ...1... Plot .Caribou.Crown.Game.Preserve.....

	On the Flight Lines	Over the Plot	Total
Flying time	2 hrs.	2 hr. 40 min.	4 hr. 40 min.
Miles	186	233	419
Square miles	46	58	104
Moose	29	51	80
Deer	6	15	21
Caribou	nil	nil	nil
Caribou yards	nil	nil	nil
Wolves	nil	nil	nil
Estimate of Wolves by tracks	5	nil	5
Wolf kills	1	nil	1 deer
Moose spotted per square mile	.63	.88	.77

Remarks:

Date .February.22nd.,.1957 Flight No. ...2... Plot ...Caribou.Crown.Game.Preserve....

	On the Flight Lines	Over the Plot	Total
Flying time	2 hrs.	2 3/4 hrs.	5 3/4 hrs.
Miles	176	224	400 miles
Square miles	44	56	100 sq. miles
Moose	24	86	110
Deer	3	8	11
Caribou	13	nil	13
Caribou yards	1	2	3
Wolves	nil	nil	nil
Estimate of Wolves by tracks	6	nil	6
Wolf kills	nil	nil	nil
Moose spotted per square mile	.55	1.5	1.1 moose

Remarks:

Flight No. 3, February 26, 1957.

Pretty well all the information recorded on to-day's flight is included on the attached forms SL 1 and H 37.

All information recorded on the flight line maps will be forthcoming in the moose inventory report. Concentration of moose tracks are being coloured in on the map to show the density in hunted areas across the district. Maps of the Game Preserve will be forwarded with the next report.

The weather was perfect for flying to-day but the count was the lowest yet.

Weather does not seem to influence the movement of moose to any great extent.

One more day on the plot should finish it off at a 1/8 sample. This may be sufficient information for our inventory.

We had considered flying the area east and west with the same distance between lines as we are using now. This idea has been abandoned as we would probably run into trouble where the lines cross in high animal concentrations. We could never be sure when we were counting herds which had been counted on previous north and south lines. This would be true of caribou in particular, as they travel quite a lot and could be several miles from where they were previously spotted. The moose too, could move enough in two weeks to confuse the tally.

Perhaps an alternative would be to do a couple of sample plots thoroughly using the orbiting method to determine the number of moose per square mile where high concentrations exist. Time and weather will probably be the deciding factor.

SL 1

Date ..February.26,.1957..... Flight No. ...3... Plot .Caribou.Crown.Game.Preserve..

	On the Flight Lines	Over the Plot	Total
Flying time	2 1/2 hours	3 hours	5.5 hours
Miles	212	217	429
Square miles	52	54	106
Moose	21	22	43
Deer	1	1	2
Caribou	nil	27	27
Caribou yards	1 north of preserve	6	7
Wolves	nil	nil	nil
Estimate of Wolves by tracks	nil	nil	nil
Wolf Kills	nil	nil	nil
Moose spotted per square mile	.4	.45	.4

Remarks: There were three caribou concentrations where we did not spot the animals. We estimate the total number on the three yards at about 25. All caribou were found between Irregular and Rostoul Lakes on the north side of the Game Preserve. The one yard outside the preserve was estimated at eight animals.

Sioux Lookout, Ontario

Date ..February.26..1957.....

H 37
Aerial Survey of Moose Flight No. 3

Plot ..Caribou.Crown.Game.Preserve..... Size ...1800....square miles
Location ...Rostoul.Lake.....
Cover Type .mostly.Jackpine.and.spruce.with.some.burn.and.some.mixed
Pilot ....H..Speight..... Navigator ....R..H..Trotter.....
Observers (right side) .....John.Shannon.....
(left side) .....Earl.Stone.....
Date covered ..February.26..1957 Noon temperature ....3.above.....
Wind direction ..Nil..... Wind speed .....Nil.....
Cloud cover .....Nil..... Altitude .....500.feet.....
Snow depth ...27.inches.....
Days since last snow .....9.....
Time of arrival over the plot .....11.a.m.....
Time survey completed on plot .....2.45.....
Number of moose seen on plot .....22.....
Notes: A.total.of.43.moose.were.spotted.including.the.flight.line..
count...Most.of.to-day's.area.was.poor.moose.range..but.....
there.was.much.more.evidence.of.caribou.at.the.north.end....
Deer.petered.out.almost.completely.with.only.one.spotted....
over.the.preserve.....

Flight No. 4, March 7, 1957

Nine days have lapsed since our last flight over the preserve and the weather has warmed up considerably. There are less moose feeding during the day now than on previous flights.

To-day the moose were practically all lying down and only twenty-three were recorded in 4 3/4 hours combined flying on the flight line and over the Game Preserve.

The Caribou count was up for two reasons, first we were doing the part where the highest concentration is located and secondly they were all out on lakes lying down where they could be easily spotted.

This completes the line flights over the area but we will try and do one plot in the southeast corner before we finish off.

There are very few moose in the area where caribou are concentrated, this shows up on the flight map which should be referred to during the perusal of the reports.

A small corner on the northwest side was not completed. It is all burned over and there are no signs of caribou or deer and very few signs of moose.

H 37
Aerial Survey of Moose

Plot Name ..No..4.flight..... Size ....1800..... square miles
Location ..Caribou.Crown.Game.Preserve.....
FRI Cover Type .....
Notes on Ground Cover .Mostly.jackpine.and.spruce.some.burn.and.....
.some.mixed.stand.....
Crew Pilot ...Harry.Speight..... Navigator ...R..H..Trotter.....
Observer right side ..John.Shannon.....
Observer left side ...E..Stone.....
Air Speed ...90.m.p.h..... Flight Altitude ...700.feet.....
Date .....March.7,.1957.....
Take off time .....10.15.a.m.....
Time of arrival over plot ....11.00.a.m.....
(30 minutes off for lunch)
Time Survey completed ...15.30.p.m.....
Temperature on Plot ..20°..above.... Snow Depth on Plot .26.inches...
Days since last snow .17..... Amount falling .....
Crust condition ...nil.....
Wind speed ...5.m.p.h..... Wind direction ....S.W.....
Cloud Cover ..nil..... Ceiling ....nil.....
Visibility conditions .....C..A..V..U.....
Number of deer seen ...2.....
Number of moose seen ...15.....
Number of caribou seen ...44.....
Notes: 8.moose,.3.deer.and.2.wolf.kills.were.recorded.on.the.flight
line.to.the.plot...This.was.the.warmest.day.we.have.had.for.
observing.moose.this.winter.and.it.was.also.our.poorest.day.
for.counting...Two.thirds.of.the.moose.counted.were.lying...
down.....

Date .March.7,.1957..... Flight No. ...4... Plot .Caribou.Crown.Game.Preserve...

	On the Flight Lines	Over the Plot	Total
Flying time	45 minutes	4 hours	4 hrs., 45 min.
Miles	120	247	367
Square Miles	30	62	92
Moose	8	15	23
Deer	3	2	5
Caribou	nil	44	44
Caribou Yards	nil	2	2
Wolves	nil	nil	
Estimate of Wolves by tracks	nil		
Wolf Kills	2		2
Moose spotted per square mile	.26	.24	.25

Remarks:

ONTARIO SALE OF LICENCE'S FOR 1956

compiled by
W. Mulholland

Hunting		
	Reciprocal	75
	Gun	286,529
	Groundhog	27,903
	Deer-Dog	10,836
	Raccoon-Dog	1,181
	Raccoon	1,090
	Non-resident small game	5,905
	Non-resident general	1,521
	Non-resident bear	1,995
	Non-resident wolf	36
Deer		
	Resident	80,940
	Farmer	16,550
	Non-resident	7,426
	Camp deer	689
	Deer-Moose	903
	TOTAL DEER	106,508
Moose		
	Resident	13,441
	Non-resident	1,520
	TOTAL MOOSE	14,961
Angling		
	Non-resident	376,000
	Manitoba	2,970
	Organized Camp	3,250
	Provincial Park	5,586
	Algonquin Park Junior	818
	Resident Smelt	18,192
	Non-resident Smelt	2,800

A STUDY OF THE YELLOW PICKEREL POPULATION IN LAKE SUPERIOR AND THE NIPIGON RIVER SYSTEM, 1956.

by
R. A. Ryder

Introduction

There has been considerable debate for several years between anglers and commercial fishermen of the Nipigon area regarding the singleness of the pickerel population in the Nipigon Bay to Polly Lake chain (Figure 1). Anglers and guides claimed that the pickerel captured in Polly Lake were migrants from the Nipigon Bay population, and consequently that commercial fishing in Nipigon Bay of Lake Superior adversely affected the population. Commercial fishermen on the other hand, maintained that two separate populations existed, one in Nipigon Bay, the other in Polly Lake and Lake Helen. This intimated that commercial fishing in Nipigon Bay would have little if any effect on pickerel angling in Polly Lake.

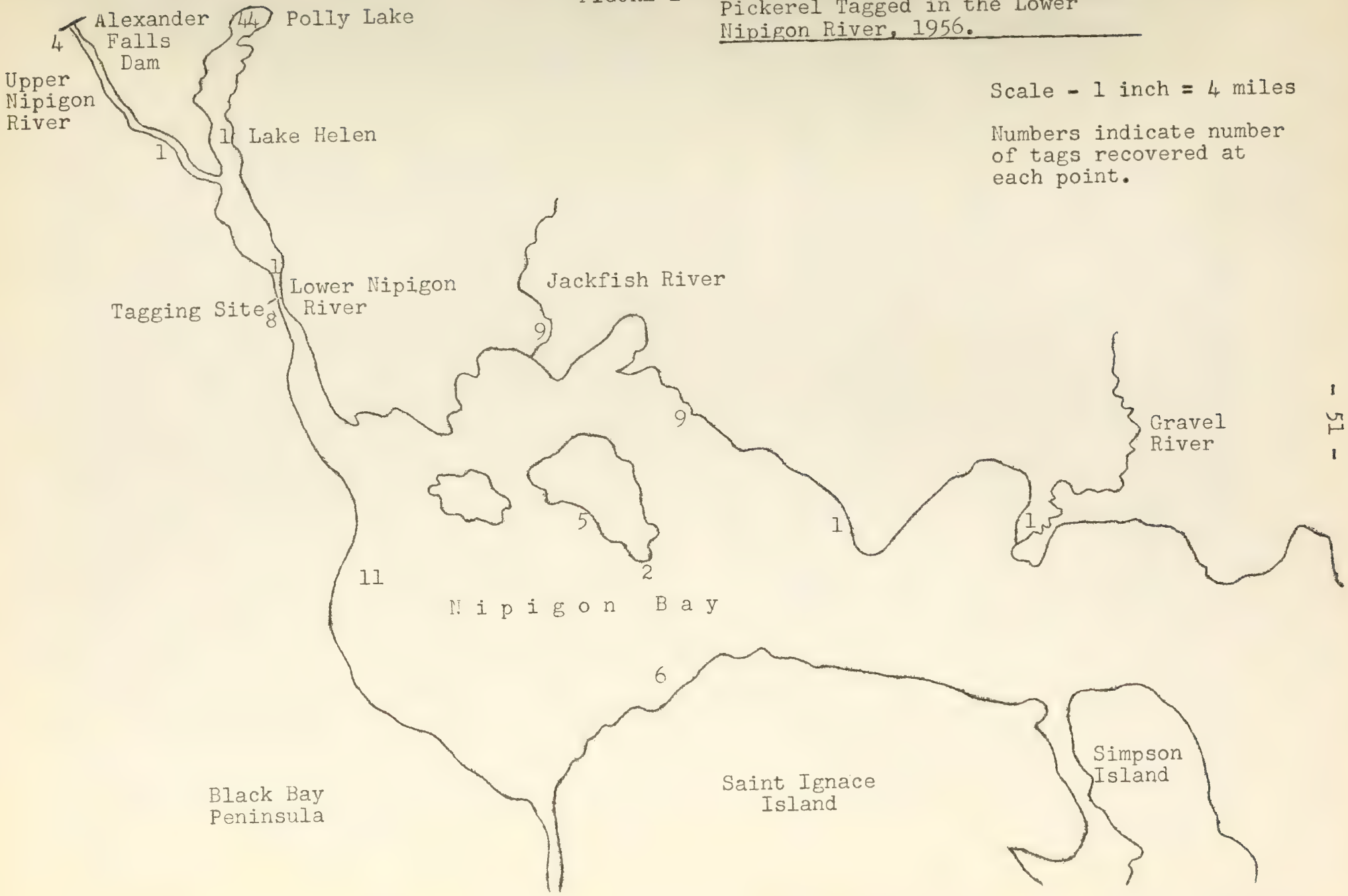
In 1955 in an attempt to solve at least part of this problem 136 yellow pickerel were tagged in the Nipigon River chain.* Subsequent tag returns (9.6%) verified the fact that at least part of the Nipigon Bay pickerel population migrated up the Nipigon River, through Lake Helen and into Polly Lake. One fish also made the return route from Polly Lake to Nipigon Bay. It was decided at this time that insufficient evidence was at hand to obtain a true picture of migration routes followed, and an approximate population estimate. Consequently, a more intensive tagging programme was planned for 1956.

Tagging Results

From the period of April 30 to May 9, 1956, 1,000 pickerel had affixed to them a plastic type streamer tag. These fish were captured in quantity, in riffle areas of the Nipigon River, presumably the spawning grounds. Both a seine and dip nets were used in the capture although the former was soon abandoned because of the difficulty of manoeuvering it on the rocky substratum.

* See Fish and Wildlife Management Report No. 35, June 1, 1957, pp. 38-42.

FIGURE I - Localities of Recovery for Yellow Pickerel Tagged in the Lower Nipigon River, 1956.



Scale - 1 inch = 4 miles

Numbers indicate number of tags recovered at each point.

TABLE I - Tag Returns Made in 1955 and 1956

Year	Lower Nipigon River		Polly Lake & Lake Helen		Total Pickerel Tagged	
	1955	1956	1955	1956	1955	1956
No. of Tagged Pickerel	90	1000	46	25	136	1025
No. of Tag Returns	7*	103	6	3	13	106
Percentage Tag Returns	7.7	10.3	13.0	12.0	9.6	10.3

* Accounts for two tags returned in 1956 which were not included in the 1955 report.

Of the 1,000 pickerel which were tagged, 103 tags were returned between May 11 and November 6, 1956. This 10.3% return is a considerable increase over the 7.7% return from the Nipigon River tagged fish of 1955 (Table 1). Of those tags returned 56.3% were caught by anglers, the remaining 43.7% being captured by commercial fishermen, lamprey barriers, or in experimental gill net sets. Table 1 shows a comparison of the tag returns for 1955 and 1956.

In 1956 a definite pattern of migration was established for the Nipigon Bay pickerel population.

The thousands of pickerel observed in the Lower Nipigon River in May during the spawning run determine the initial migration from Nipigon Bay in late April and early May. From here the bulk of the population moves up the Nipigon River through Lake Helen and into Polly Lake. Thirty-seven tag returns made in Polly Lake in June substantiate this theory. One tag return each from the Jackfish and Gravel Rivers in June gives an indication that at least part of the population after spawning return to Nipigon Bay and run up other tributary streams. This is further verified by Mr. J. C. Hallam, biologist of the Fisheries Research Board of Canada, who in personal correspondence indicated that a total of 1,249 yellow pickerel were captured in nets on either side of an electrical lamprey weir in the Jackfish River between July 7 and August 11. Eight of these fish were tagged pickerel, seven captured in July and one in August. One tagged pickerel each was captured during July in Lake Helen, the Lower Nipigon River, and Nipigon Bay, again showing a tendency towards a downstream migration. The rate of tagged fish captured in Polly Lake during July and August drops off sharply as the downstream movement begins. This is further evidenced by the poor angling experienced in Polly Lake after the first of September when only rarely is a pickerel caught. A two hundred yard gill net set made in Polly Lake on November 7 and lifted on November 8 netted only three yellow pickerel. It was located at the same site that a similar net had captured thirty pickerel on June 8. In August, the greatest number of tag returns (six) came from the Lower Nipigon River. Two pickerel appeared in the Upper Nipigon River for the first time and an additional two were captured in Nipigon Bay by commercial fishermen. In September three more tagged fish were captured in the Upper Nipigon River and nine in Nipigon Bay. By October most of the pickerel had

apparently reached Nipigon Bay as evidenced by twenty tag returns from that location. Only one other return was made during that month, from the Lower Nipigon River. During November only two tags were returned, both from Nipigon Bay. Table 2 shows the month by month distribution of tag returns from the 1,000 pickerel tagged in the Lower Nipigon River. Figure 1 shows the localities where the tagged pickerel were recovered.

Of the twenty-five pickerel tagged in Polly Lake during 1956, one each was recaptured in Polly Lake in June and August. The remaining tag was returned from Nipigon Bay in September.

TABLE II - Distribution of Recovered Tagged Pickerel by Month

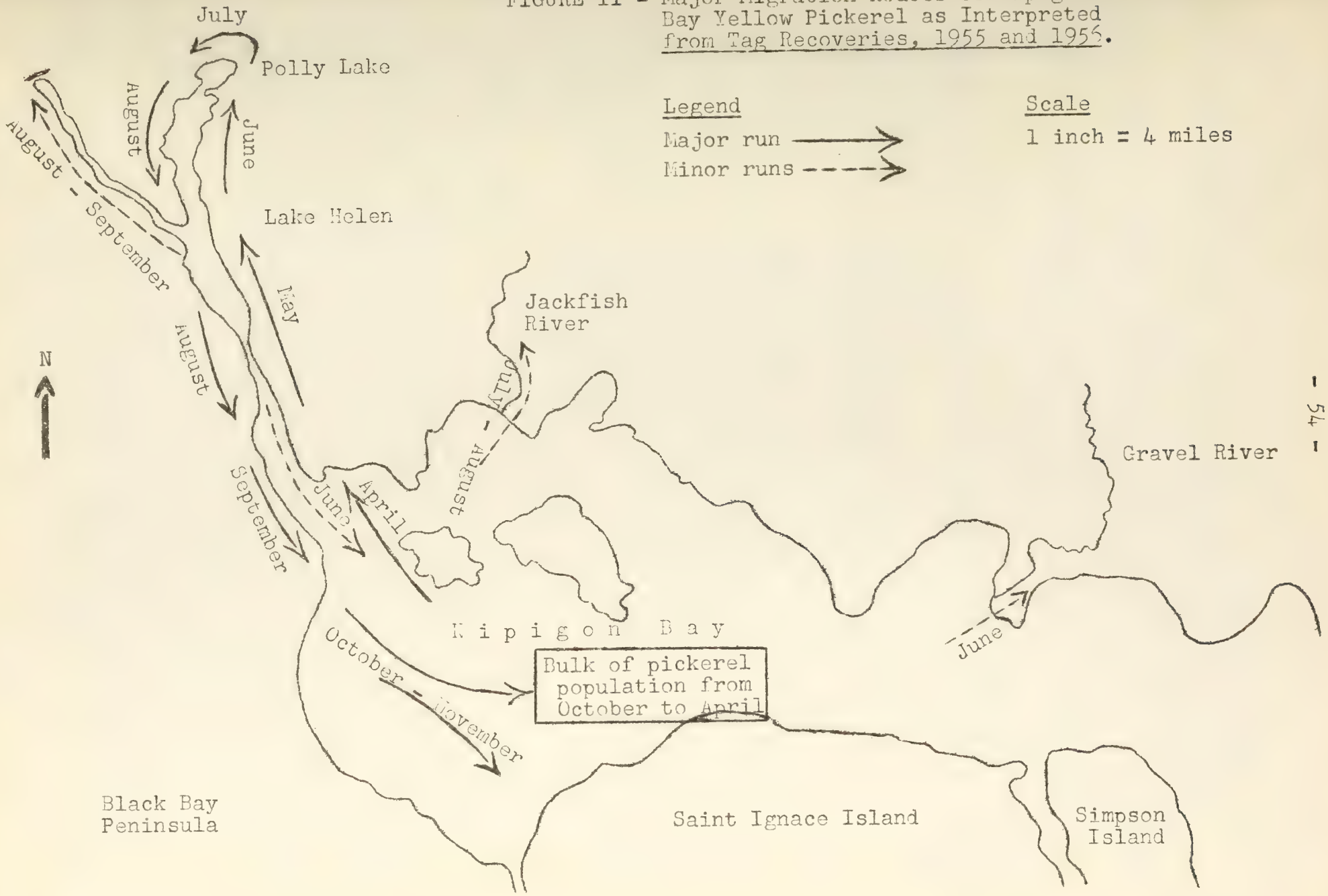
	May	June	July	Aug.	Sept.	Oct.	Nov.
Polly Lake		37	4	3			
Lake Helen			1	1			
Upper Nipigon River				2	3		
Lower Nipigon River	1		1	6			
Jackfish River		1	7	1			
Gravel River		1					
Nipigon Bay			1	2	9	20	2

Figure 2 shows the main migration route taken by the bulk of the pickerel population, together with the localities you would expect to find them on certain dates.

Almost one half (forty-four) of the tag recoveries were made in Polly Lake, a distance of about nine water miles from the point of tagging. The bulk of the remainder (thirty-four) were taken at various points in Nipigon Bay by commercial fishermen. These recoveries ranged from nine to twenty-four miles from the point of tagging. Assuming that most of the tagged pickerel travel to Polly Lake before returning to Nipigon Bay (as evidenced by the forty-four tag returns made in Polly Lake) it would not be unreasonable to add the return distance to Polly Lake from the tagging site, to all those records in Nipigon Bay. This would bring the farthest record in Nipigon Bay up to a minimum of forty-two miles travelled after being tagged. The maximum distance travelled direct from the tagging site to the point of recovery was the individual recaptured in the Gravel River, thirty-two water miles from the tagging site. The average distance travelled from point of tagging to the point of recovery was 10.1 miles. Table 3 shows the minimum distances travelled from the tagging site to the point of recovery.

The first tagged fish was recaptured on June 1, twenty-five days after tagging. The remainder were caught at various dates up to November 6 or 189 days after tagging. The average length of time which elapsed before the fish were recovered was 95 days. There was apparently no relationship between the time elapsed and distance removed from the tagging site except at certain times of the year the

FIGURE II - Major Migration Routes of Nipigon Bay Yellow Pickerel as Interpreted from Tag Recoveries, 1955 and 1956.



population was farther from the tagging site than at others. This was explained previously when the migration route was outlined.

Two tagged pickerel were captured during 1956 which were tagged on May 1, 1955. These fish were both captured in Polly Lake a total of 379 and 411 days after their release.

TABLE III - Distances Travelled by Tagged Yellow Pickerel, 1956

Locality Tagged	Locality Recovered	Number Recovered	Distance Travelled (miles)
Lower Nipigon R.	Polly Lake	44	9
Lower Nipigon R.	Lake Helen	1	1
Lower Nipigon R.	Smith's Bay, Lake Helen	1	5
Lower Nipigon R.	Parmachene, Upper Nipigon R.	1	6
Lower Nipigon R.	Alexander Falls, Upper Nipigon River	4	10
Lower Nipigon R.	Lower Nipigon River	8	0
Lower Nipigon R.	Brule Shoal, Nipigon Bay	11	9
Lower Nipigon R.	South of Vert Is., Nipigon Bay	5	13
Lower Nipigon R.	MacKinnon Point, Nipigon Bay	2	15
Lower Nipigon R.	West of McInnes Pt., Nipigon Bay	9	15
Lower Nipigon R.	West of Cape Nono, Nipigon Bay	6	17
Lower Nipigon R.	East of Grant Pt., Nipigon Bay	1	24
Lower Nipigon R.	Jackfish River	9	13
Lower Nipigon R.	Gravel River	1	32
Polly Lake	Polly Lake	2	0
Polly Lake	McInnes Point, Nipigon Bay	1	19

Population Estimate

It would be both desirable and practicable at this point to make an estimate of the Nipigon Bay pickerel population. By doing so we can determine if the commercial fishing in Nipigon Bay would have any adverse effect on the angling of Polly Lake. Unfortunately, the sport fishing harvest is not known. A creel census will be run on Polly Lake during 1957 to obtain data. For the present population estimate we will assume that the tag returns from the Polly Lake fish make up the same percentage of the total number of fish captured as those tag returns obtained by other means. Returns by commercial fishermen (Table 4) are most accurate for this purpose as rather precise records are kept of the total weight of pickerel taken from Nipigon Bay. The average weight of these fish was obtained from pickerel taken in $4\frac{1}{2}$" (stretched measure) nylon nets, used to sample the same population. The percentage tag returns compared to the total number of pickerel captured in the lamprey weir was probably the least accurate as it is possible that the same fish were handled more than once. The net sampling in Lake Helen and Polly Lake, produced exact figures but because of the relatively small sample can only be used collectively with the other categories for the population estimate.

TABLE IV - Breakdown of Tag Returns from Nipigon River Tagged Pickerel

	No. of Tags Returned	Total No. of Fish Captured	Percentage Tagged Fish of Total Captured
Anglers	59	7,375 *	0.8 *
Commercial Fishermen	34	3,837 **	0.9
Jackfish River, Lamprey Weir	7	1,249	0.6
Net Sampling	3	186	1.6
TOTALS	103	12,647 Weighted Average	0.8

* Weighted figure obtained from percentage of tagged fish returned in remaining three categories.

** Estimate obtained from tonnage of pickerel captured by commercial fishermen.

As only mature pickerel were tagged, and the commercial and sport-fishing harvest consists almost entirely of mature fish, a population estimate can be made of the numbers of yellow pickerel measuring fourteen inches and upwards inhabiting Nipigon Bay and its tributary waters. Employing the following equation we obtain an approximation of the yellow pickerel population.

$$\frac{F_1}{P_1} = \frac{F}{P}$$

where:

F_1 = Number of marked fish recaptured.
P_1 = Total number of fish captured.
F = Total number of marked fish in lake.
P = Total fish population in lake.

Therefore:

$$\frac{103}{12,647} = \frac{1000}{P}$$

$$P = 122,786.$$

Rounding off the above calculation to significant figures we obtain an adult pickerel population of about 123,000 fish inhabiting Nipigon Bay and its tributary waters.

Effect of Commercial Fishing on Angling in Polly Lake

Both commercial fishermen in Nipigon Bay and anglers in the Nipigon River chain of lakes harvest the same adult population of pickerel. Commercial fishermen, however, are required by law to take only those pickerel measuring over fourteen inches in length. The mesh sizes of their gill nets ($4\frac{1}{2}$" extension measure) almost exclude the possibility of catching smaller pickerel than this, with the

exception of an occasional small one that becomes entangled in the mesh with its teeth. Even in the pound nets the fish would average larger than the angling catch as long as the fourteen inch size limit is in force.

Anglers, on the other hand, have no minimum size limit and their average pickerel is smaller than the average taken by commercial fishing because of the less selective gear employed. Even so, very few immature pickerel are retained by anglers.

Of the estimated number of pickerel harvested during 1956 (Table 4) about two-thirds were taken by anglers, the remaining third being harvested by commercial fishermen. About ten percent of the total adult population was harvested by all fishing factions together.

The effect of commercial fishing in Nipigon Bay during 1956, on Polly Lake angling cannot yet be determined. However, during the past couple of years because of the drastic decline of lake trout in Lake Superior, commercial fishermen have been fishing the pickerel heavier than formerly. Over this same period there has been a feeling among some Polly Lake anglers that the pickerel captured during 1956 averaged considerably larger in size than those of 1955. This was borne out by the measurement records taken from the spawning fish during the 1955 and 1956 spawning runs in the Lower Nipigon River. As these fish were captured using dip nets in both years a comparison can be made. It is interesting to note that the average length during 1955 was 16.5 inches while in 1956 it jumped to 17.4 inches. This increase of 0.9 inches is most certainly a significant one and can possibly be explained by the commercial catch which has increased immensely over the past two years, thus reducing the competition factor among the pickerel themselves. The drastic reduction of lake trout in Lake Superior resulting from lamprey depredations also removes an important competitive factor making more food available to the pickerel. It might be concluded then, that the present rate of exploitation is far below the maximum catch that could be taken to improve the quality of the population. It would be desirable in the future, however, to set a tonnage limit on yellow pickerel taken by commercial fishing in Nipigon Bay. At present this is unnecessary as the harvest has not yet approached the point where optimum benefits to the pickerel population and subsequently to the angler are received.

Activities of the Yellow Pickerel on the Spawning Grounds

The pickerel were first noted on the spawning grounds in shallow water on April 29. They were fairly numerous on this date even though the water temperature was only 34.0° F. A large pebble and boulder substratum was preferred, usually just out of the main current or in a back eddy. The numbers of fish observed on the following two nights increased although the water temperature rose only one degree. The pickerel appeared in greatest abundance between 11:00 p.m. and 2:00 a.m. the following morning. Each evening the smaller males arrived on the grounds first and were succeeded then by the larger fish both males and females. The sex ratio as observed over the tagging period is shown on Table 6. Each surge of water

from the river moved more pickerel into the shallows which allowed themselves to be carried up on the shoals by the back-currents. By May 7 other species of fish appeared on the shoals with the pickerel including white suckers (Catostomus commersonii), long-nosed suckers (Catostomus catostomus), whitefish (Coregonus clupeaformis) and the odd sturgeon (Acipenser fulvescens). The pickerel themselves appeared more sluggish and easier to capture with dip nets than previously. They maintained tighter groups and generally occupied shallower water than during the early run. A noticeable fluctuation in the water levels appeared from day to day, although no definite correlation could be established between this fact and pickerel activity on the spawning grounds. By May 9 a strong wind made the river water extremely turbid and the pickerel more wary. They shied away from the shallow water and demonstrated their negative phototropism more strongly than previously. On this date the water temperature was only 36.0°F and the fish examined were not yet ripe. On May 11 the fish reached their greatest abundance and were the least wary during the period of observation. They occurred in shallower water than that in which they had occupied to date. This possibly resulted from the overcast night which obscured the moonlight. By May 14 the water temperature had risen to 38°F but the fish had returned to the deeper water possibly because of a very bright moon. The density of the pickerel on the spawning grounds steadily decreased until May 22 when they were absent altogether. From then until May 31, the river was extremely muddy and no pickerel were observed.

The pickerel had not spawned on the grounds of the Nipigon River during the period of observation. Because of this a complete picture of sex ratios on the spawning grounds was probably not obtained and leaves a doubt as to what the sex ratio would have been towards the end of the spawning period. Eschmeyer (1942) observed that many walleyes did not spawn in 1940 under favourable conditions. Many females examined during June and July in the Norris Reservoir were still carrying mature eggs. Derback (1947) noted that stream-migrant walleyes which encountered cold weather while on the spawning grounds returned to the lake and did not reappear in the streams. Female pickerel were subsequently caught in the lake in June which were resorbing their eggs.

In the Nipigon River the pickerel were not observed spawning during the period they remained in the shallows. This was possibly due to the extremely long, cold spring and the correspondingly low water temperatures which ensued. During the heaviest portion of the run (April 30 to May 18) the highest water temperature encountered was only 39.0°F (Table 6). These water temperatures were possibly too low for satisfactory spawning. Other authors give optimum spawning temperatures as 46°F to 48°F. Cobb (1923), 38°F to 44°F. Eddy and Surber (1947), 43°F. Derback (1947), and Herman (1947) 38°F to 44°F. Ripe female pickerel were observed by the author in Polly Lake on June 8, 1956. It is not known, however, if satisfactory reproduction would be possible in this lake because of the soft substratum and the predominantly weedy shoreline.

Feeding Activity During Spawning Run

On May 5, thirty-three pickerel were examined for stomach contents to determine the feeding activity during the spawning run. The results were as follows:

Food Item	Percentage of Total Number of Pickerel Examined
Empty	36
Fish Remains (well digested)	58
Plant Remains	3
Organic Matter	3
Identifiable Fish Remains	9
Stizostedion sp.	3
Coregonidae	3
Osmerus mordax	3

While the food analysis did not reveal any great feeding activity, the degree of freshness of the identifiable fish precluded that at least some of the pickerel were feeding. This was further substantiated the following day when several pickerel were captured on a spoon and several more were lost about one-quarter of a mile below the spawning grounds.

Predation

Stomach samples of four whitefish (*Coregonus clupeaformis*) and one white sucker (*Catostomus commersonii*) were taken on the pickerel spawning grounds during the tagging period. It was hoped that some indication could be obtained as to the extent of predation by whitefish and suckers on pickerel spawn. Unfortunately the pickerel failed to spawn during the tagging period and substantial data could not be expected. The qualitative results of the stomach samples were as follows: whitefish - insect larvae, one earthworm, and many small mollusks; white sucker - stomach empty.

Sex Ratio

As it was previously noted, in order to insure a successful tagging program with a minimum of mortality to the tagged fish, sex was determined by gently rubbing the abdominal region caudad and identifying the seminal product emerging from the genital aperture. Hence, for the most part only ripe or near ripe fish could be identified as to sex. As the tagging operation took place early in the spawning run, it was generally near ripe males that were identified in this manner. Four hundred and eleven fish were retained for scale samples and all of these but five were sexed by opening the body cavity and examining the genitalia. The results are shown in Table 5.

TABLE V -

	Number	Percentage	Sex Ratio - Number of Females Per 100 Males
Males	172	42.4	100
Females	234	57.6	136

The fact that females constituted 57.6 percent of the total sample agrees very closely with what Eschmeyer (1950) found in the Muskegon River during the spawning run in 1947. Here he found that the spawning season sample was composed of 58 percent females, but goes on further to explain that this may be due to the selectivity of the dip nets used on the Muskegon River. In using dip nets some fish are bound to escape and females being burdened with eggs are not likely to be so active as males. Hence, Eschmeyer's conclusions are that the more active males escape the dip nets more frequently, resulting in a biased sample.

Eschmeyer further explains that a barrier (Newaygo Dam) near the sampling site might be a second possibility accounting for the high percentage of females in the sample. In the present study this possibility is ruled out as no barriers exist near the sampling site.

In Lake Gogebic, Eschmeyer found 89 percent males out of 4,315 adult pickerel sampled on the spawning grounds by trap net. It is our contention that a trap net tends to bias the sample in favour of the male pickerel. The males, being more active on the spawning grounds, are much more likely to be captured in a stationary type of net such as a trap net than are the more sedentary females. Perhaps, a figure somewhere between those obtained by the two sampling methods (dip net and trap net) would give a better indication of the true sex ratio during the spawning run. Table 6 gives a day by day breakdown of the sex ratios and agrees closely with the works of other authors, Eschmeyer (1952) and Schneberger (1938, 1939, and 1940).

TABLE VI

Date	Water Temperature	Number		Percentage	
		Males	Females	Males	Females
April 30	35.0° F	17	10	63.0	37.0
May 1	34.5	15	16	48.4	51.6
May 2	35.0	18	13	58.1	41.9
May 3	35.0	16	13	55.2	44.8
May 4	35.0	14	18	43.8	56.2
May 5	35.0	13	18	41.9	58.1
May 6	35.0	10	23	30.3	69.7
May 7	36.0	10	20	33.3	66.7
May 8	36.5	16	16	50.0	50.0
May 9	36.0	12	18	40.0	60.0
May 11	37.5	14	16	46.7	53.3
May 14	38.0	6	27	18.2	81.8
May 16	38.0	11	22	33.3	66.7
May 18*	39.0	0	2	-	-

* The water was very silty on this date and fish were difficult to capture, resulting in an extremely small sample.

On all sampling days except May 11, 14, 16 and 18, the pickerel required for age and growth data and from which the sex ratios were obtained, were captured in dip nets after the tagging operation was completed. This meant that any diurnal variation of sex ratios on the spawning grounds were not accounted for, as most of the samples were taken approximately between 2:00 a.m. and 4:00 a.m. The four exceptions were the above noted on May 11, 14, 16 and 18, when tagging operations were not carried out and the fish required for age and growth data were captured during the early part of the run for the night, between 10:00 p.m. and 11:00 p.m.

Length-Frequency Distribution

Length-frequency data were compiled for 1411 mature pickerel taken during the 1956 spawning run in the Lower Nipigon River. They ranged in total length from 12.4 inches to 26.2 inches. These were plotted in one inch length increments against number of fish (Figure 3). From this graph we see that the 17 to 18 inch increment contains the greatest number of fish and can be considered as the mode for this spawning population. The average length of the mature fish, both sexes included, was 17.4 inches. Over ninety percent of the spawning pickerel were included in the fourteen to twenty inch grouping.

Diseases and Parasites

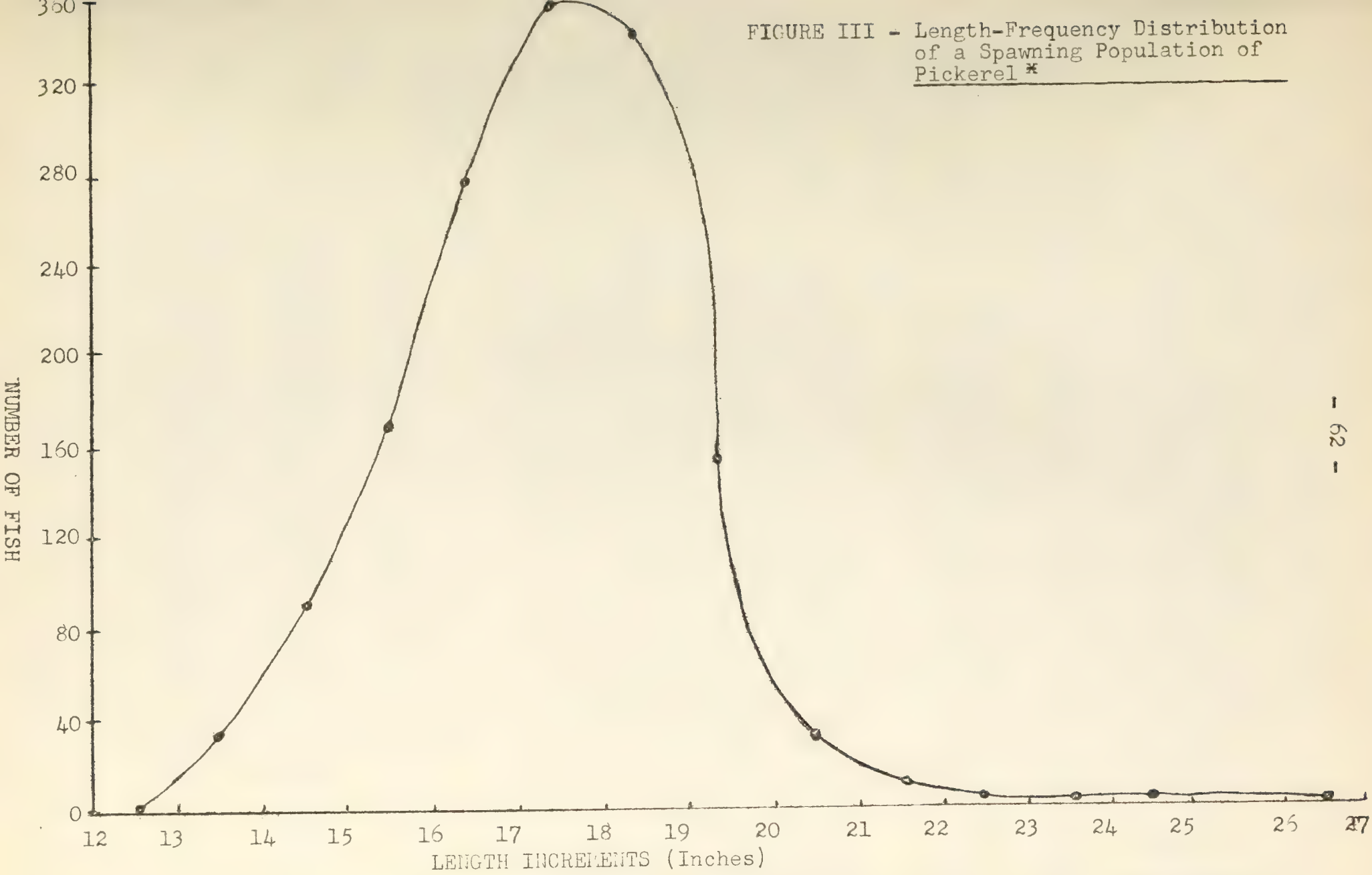
All the pickerel which were tagged or from which scale samples were taken during the spring spawning run were given a cursory examination for external parasites or diseases. Of the 1411 pickerel examined, 311 or 22% bore signs of lymphocystis disease. It is possible that under the poor light conditions in which the fish were examined, some of the growths were actually tumors or carcinomas, particularly if the disease occurred in an early stage. All were classified, however, as lymphocystis because it was realized that this was by far the most prevalent disease.

Of the 1,000 fish which were subsequently tagged and examined in the Lower Nipigon River, 25% were infected at least to some degree with lymphocystis. It was expected that a lesser percentage of the tagged fish which were captured and reported would have this disease as mortality took its effect. However, the opposite was true. Thirty-two percent of all tagged fish returned were those which were infected with lymphocystis at time of tagging. This is possibly an indication of the susceptibility of the diseased fish to capture, both by angling and by netting.

One hundred and eighty-eight pickerel were examined in Lakes Helen and Polly between the period of June 8 and November 8, 1956. Only 6% of these fish were infected with lymphocystis disease.

Many of the spawning fish bore the fungus Saprolegnia which probably resulted from the prenuptial activity which removed the protective mucous from the epidermis. In some cases, Saprolegnia appeared to be a secondary infection taking root in the wake of some other disease.

FIGURE III - Length-Frequency Distribution of a Spawning Population of Pickerel *



* Compiled from total length measurements taken from 1411 mature pickerel during the spawning run in Nipigon River, 1956.

The parasitic copepod Argulus was not observed on any of the spawning fish in the Nipigon River. Small numbers of pickerel captured in Polly Lake, however, in July and August of 1955 and 1956 were lightly infected with Argulus. Fish to be tagged when immersed in the urethane solution would invariably shed this parasite in short order.

Parasitic leeches were occasionally observed on a few of the spawning pickerel usually about the caudal region. These were normally fewer than four in number on each individual fish.

Only one fresh sea lamprey scar was found on the 1411 pickerel examined. Other healed scars were observed on several fish but were believed to be wounds from spears, snares or other implements often employed in poaching these fish.

Acknowledgments

Conservation Officer C. A. Rettie, of Nipigon contributed most to this project and was solely responsible for the water temperature series. J. Holt, C. A. Rettie, P. Odorizzi, H. Height, and G. Whitefield assisted during the tagging operations. D. D'Agostini and E. J. Swift were also instrumental in making the tagging project a success. Mr. and Mrs. E. Wilson of the Polly Lake Cabins were responsible for obtaining most of the tag returns by angling. Commercial fishermen William Legault and the Gerow Brothers, and Conservation Officer J. Scott of Pays Plat insured successful tag returns from Nipigon Bay. J. Hallam of the Fisheries Research Board of Canada co-operated with information on the effect on the pickerel migration of the Jackfish River lamprey weir, and obtained tags and data from pickerel captured at the weir. Others, too numerous to mention, assisted in various ways during the past year, particularly in taking time to see that tags were returned to the Department. To these people we are greatly indebted.

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CREEL CENSUS - KENORA DISTRICT - 1955.

by
J. M. Fraser

Introduction

The purpose of the creel census carried out in the Kenora District is to ascertain the quality of angling and to some extent the quantity of angling in this district. To obtain this information creel census log books, creel census cards and fish resources questionnaires have been distributed throughout the district. A detailed description of the methods used and various factors to be taken into consideration in interpreting the creel census data were presented in last year's report (Creel Census - Kenora District - 1954).

Return of Creel Census Cards and Logbooks

The logbooks and creel census cards returned to the Department with information covered 2111 anglers who fished a total of 14059 hours. This is a slight decrease from the 2612 anglers who fished 16164 hours in 1954. As in 1954 the bulk of the information was obtained through the efforts of a relatively small number of persons. These were mainly guides and camp owners, who were in a position to observe a good deal of angling. Creel census information was also obtained by the Conservation Officers in the course of their patrols. The creel census data on hand are selective and probably reflects the angling success experienced by guided parties or local anglers familiar with the waters.

Creel census log books provided 90% of the information collected in 1955. In the future the creel census card will be dispensed with except in certain circumstances.

Angling Success - Lake of the Woods

A summary of the creel census information collected on Lake of the Woods during 1954 and 1955 is presented in the first two columns of Table I. In 1955, 1236 anglers reported catching 9312 fish at the rate of 1.3 per hour as compared with 1.0 per hour in 1954. In terms of pounds the 1955 catch was 2.5 pounds per hour compared to 2.0 pounds per hour in 1954.

The increase of 0.3 fish per hour from 1954 to 1955 is not believed to be significant but it does demonstrate the need for more creel census information and also points out the care required in interpreting a relatively small sample to represent the general picture. In 1955 five guides from one camp kept extensive records of their fishing - they did not keep records in 1954. The waters they fish are particularly abundant in pike as well as pickerel and as a result the reported catch of pike in our records is much higher

than last year. Whereas in 1954 pike made up 22% of the catch in 1955 this percentage jumped to 32%.

The yellow pickerel was the dominant species in the anglers' catch in both years and were caught at approximately the same rate. This species made up 72% of the catch in 1954 and 61% in 1955. The average weight of the pickerel was reported as 1.5 lbs.

More smallmouth bass were reported caught in 1955 but as in 1954 many of these were released after capture. The data on lake trout and maskinonge are too limited for discussion. Black crappie, perch and sauger were also reported by anglers from the southern part of the lake.

It appears that 1955 was a good angling year on Lake of the Woods with anglers taking fish at the rate of one per hour. The creel census data agree reasonably well with information obtained through personal contacts, correspondence, and other sources.

Angling Success - Other Lakes of Kenora District

Creel census reports of angling in 48 other lakes of the Kenora District have been received but there are insufficient data on any particular lake to allow a separate analysis. Therefore, the information from these lakes has been combined, summarized and presented in columns 3 & 4 of Table I.

The fishing success as reported from these lakes averages 1.2 fish weighing 2.6 pounds per angling hour. Pickerel and pike made up over 90% of the anglers catch from these lakes (see Table II).

In 14 lakes in which angling was almost entirely for lake trout in the spring and fall periods 177 anglers caught 420 lake trout in 1039 fishing hours at a rate of one lake trout every 2½ hours. This angling success is down slightly from last year when only two hours were required to catch each trout. The average weight of trout in 1955 was 4.2 pounds as compared to 4.0 pounds in 1954.

A creel census box set-up at Lost Lake collected 20 creel census cards covering the speckled trout angling in that lake. Sixty fishermen caught 118 speckled trout weighing 164 pounds at a rate of one fish per 3.3 hours. This is better angling than in 1954 but the fish are smaller.

Tourist Camp Owners' - Estimates of Angling Success

As in 1953 and 1954 each tourist camp owner received a Fish Resources Inventory form to complete & return to the district office. The purpose of this questionnaire was to find out the exploitation our lakes receive from non-resident anglers and the angling success these anglers experience during their visit. In 1955, 33% of the questionnaires were returned to this office in comparison to a 29% return in 1954 and 15% in 1953.

Table III & IV compare the return of questionnaires from tourist camps for the period 1953 - 1955. From these returns there are 1244 fishing days per season from the average camp on Lake of the Woods and 960 days from camps located on other lakes.

In the questionnaire the camp owners were requested to estimate the average daily catch by one angler in the lakes regularly fished by that camp. In many lakes a combination of species is angled for while in other lakes certain species are specifically sought. It is difficult, however, to distinguish between "general" fishing and "specific" fishing and no attempt is made to do this in the following summary. Where an estimate of the daily pickerel catch has been made it has been summarized in the pickerel table. In many cases pike or smallmouth bass were also caught on the fishing trip but these are entered in their respective tables.

Pickerel

In Table V tourist camp owners' estimates of the daily pickerel catch for 1953, 1954 and 1955 are compared and show a remarkable stability. As an aid in interpreting this table the following is given. In column #3 for 1955, 98 camp owners estimated the average daily pickerel catch on 75 different lakes to be 4.8 fish weighing 10.9 pounds.

The average pickerel in 1955 weighed 2.3 pounds. In Lake of the Woods in 1955 (column #6) 31 camp owners estimated the daily pickerel catch to be 3.8 fish weighing 8.5 pounds or averaging 2.2 pounds. A glance at the other columns covering 1953 and 1954 shows no radical change in catch.

Northern Pike (Table VI)

Camp owners on Lake of the Woods estimated that their guests daily caught 3.2 pike averaging 3.7 pounds (each) in weight during the 1955 angling season. Camps located on other lakes estimated the average catch to be 4.4 pike weighing on the average 5.3 pounds each. According to tourist camp owners on Lake of the Woods their daily pike catch has decreased from 3.7 in 1953 & 1954 to 3.2 in 1955 while there has been an increase in the other lakes of the district from 3.5 pike per day to 4.4 per day.

Smallmouth Bass (Table VII)

The position of the smallmouth bass in the angling picture of the Kenora District is an unique one. Although it is fairly abundant in many waters it is seldom specifically fished and when caught is returned to the water a good percentage of the time. Whereas 31 camps on Lake of the Woods reported catching pike and pickerel only 15 bothered to mention the smallmouth bass in the questionnaire. In 24 other lakes the daily bass catch averaged 3.2 fish weighing 2.0 pounds on the average.

Lake Trout

There are numerous lake trout lakes in the Kenora District which are fished only in the spring and fall periods and specifically for lake trout. Very few of these lakes contain pickerel and as a result are not fished to any extent except for lake trout in season. The data for these lake trout lakes in Table VIII show an amazing stability over the period 1953 - 1955. The average daily catch during this period has oscillated between 3.0 & 3.2 fish weighing on the average 4.1 - 4.6 pounds each.

Maskinonge

The maskinonge is particularly sought only by a few anglers in the Kenora District and probably the greater percentage of these fish are taken accidentally by anglers fishing for other species. Maskinonge have been reported caught in at least 50 lakes situated in the western portion of the district. The eastern border of their range lies along the Manitou Lake chain north to Dinorwic Lake. Lake of the Woods, Eagle Lake and a chain of five smaller lakes near McIntosh are noted for the muskie fishing they provide.

Thirty-nine Lake of the Woods camps reported catching 84 maskinonge in 1955. These fish ranged from 10-35 pounds and averaged 19 pounds in weight. The 39 camps represent 1/3 of the camps on this lake and the total muskie catch in Lake of the Woods for the 1955 season probably did not exceed 500 fish.

Seven of the 23 tourist camps on Eagle Lake reported taking 78 muskies during the 1955 season. These fish averaged 12-15 pounds in weight.

District-wise 277 maskinonge were reported by 102 of the 307 tourist outfitters' camps during the 1955 angling season.

Summary

Generally speaking angling was of an excellent quality in the Kenora District in 1955. The creel census data collected by means of creel census cards and creel census log books agree reasonably well with estimates of angling success made by tourist camp owners. Angling for warm water species yielded over one fish (2.5-3.0 pounds) per hour while the lake trout lakes yielded one lake trout (4.2 pounds average) for every 2½ hours of angling.

TABLE I - Comparison of 1954 and 1955 Creel Census Data

	Lake of the Woods		Other Lakes-	
	1954	1955	1954	1955
Number of Anglers	1238	1236	1374	875
Number of Fishing-Hours	7562	7127	8602	6932
No. of Pickerel Caught	5387	5692	3081	4118
No. of Pike Caught	1667	2980	2990	2312
No. of Bass Caught	438	612	330	102
No. of Maskinonge Caught	8	3	26	29
No. of Lake Trout Caught	71	25	1174	625
No. of Speckled Trout Caught			65	141
No. of All Species Caught	7571	9312	7666	7327
No. of Fish per hour	1.0	1.3	0.9	1.1
Pounds of Pickerel Caught	8546	8435	5865	7634
Pounds of Pike Caught	4788	8364	10285	8844
Pounds of Bass Caught	784	1125	569	174
Pounds of Maskinonge Caught	158	46	408	379
Pounds of Lake Trout Caught	509	219	4559	2477
Pounds of Speckled Trout Caught			89	175
Pounds of All Species Caught	14785	18189	21775	19683
Pounds of Fish per Hour	2.0	2.5	2.5	2.8

TABLE II - Percentage Composition of Anglers' Catch as Reported by Creel Census Cards and Log Books

	Lake of the Woods			Other Lakes		
Species	Av. Wt.	% of Tot. Catch	% of Tot. Weight	Av. Wt.	% of Tot. Catch	% of Tot. Weight
Pickerel	1.5	61%	46.5%	1.6	59%	42.6%
Pike	2.8	32%	46%	3.2	32%	45.8%
Lake Trout	8.8	0.3%	1.2%	4.1	3.9%	7.2%
Smallmouth Bass	1.7	6.6%	6.1%	1.8	4.3%	3.4%
Maskinonge	15.3	0.1%	0.2%	13.3	0.2%	0.1%

TABLE III - Return of Questionnaires - Lake of the Woods

	1953	1954	1955
No. of Questionnaires sent out	124	127	127
No. of Questionnaires returned	18 (14%)	35 (28%)	39 (31%)
With complete information	16	30	33
No. of Fishing days per Camp	1835	1308	1244

TABLE IV - Return of Questionnaires - Other Lakes of Kenora District

	1953	1954	1955
No. of Questionnaires sent out	172	180	180
No. of Questionnaires returned	28 (15%)	54 (29%)	63 (35%)
With complete information	21	44	58
No. of fishing days per camp	1176	865	960

TABLE V - Summary of Tourist Camp Owners' Estimates of the Average Daily Pickerel Catch in the Lakes of the Kenora District 1953-1955.

	Other Lakes			Lake of the Woods		
	1953	1954	1955	1953	1954	1955
Number of estimates	50	75	98	16	30	31
Number of Lakes covered by estimates	44	62	75	1	1	1
Average Daily Catch by One Angler	4.4	4.4	4.8	4.3	3.6	3.8
Average daily catch in pounds	10.4	10.8	10.9	9.6	7.0	8.5
Average wt. of Pickerel	2.4	2.5	2.3	2.2	2.0	2.2

TABLE VI - Summary of Tourist Camp Owners' Estimate of the Average Daily Pike Catch in the Lakes of the Kenora District, 1953-1955.

	Other Lakes			Lake of the Woods		
	1953	1954	1955	1953	1954	1955
Number of estimates	50	92	118	16	29	31
Number of Lakes covered by estimates	47	77	84	1	1	1
Average Daily Catch by One Angler	3.5	3.6	4.4	3.7	3.7	3.2
Average Daily Catch in Pounds	16.3	18.0	23.3	15.6	14.6	11.8
Average Weight of Pike	4.7	5.0	5.3	4.2	3.9	3.7

TABLE VII - Summary of the Tourist Camp Owners' Estimates of the Average Daily Smallmouth Bass Catch in Lakes of the Kenora District, 1953-1955.

	Other Lakes			Lake of the Woods		
	1953	1954	1955	1953	1954	1955
Number of estimates	19	21	28	10	10	15
Number of lakes covered by estimates	17	20	24	1	1	1
Average Daily Catch by One Angler	1.6	3.2	3.2	2.4	1.8	0.9
Average Daily Catch in Pounds	3.6	8.1	6.5	4.9	3.7	1.8
Average Weight of Bass	2.2	2.5	2.0	1.9	2.0	2.0

Table VIII - Summary of Tourist Camp Owners' Estimates of the Average Daily Lake Trout Catch in Lakes of the Kenora District, 1953 - 1955.

	Other Lakes			Lake of the Woods		
	1953	1954	1955	1953	1954	1955
Number of estimates	6	40	59			
Number of lakes covered by estimates	8	37	55			
Average Daily Catch by One Angler	3.2	3.0	3.1	Insufficient Data		
Average Daily Catch in Pounds	13.6	13.9	12.8			
Average Weight of Trout	4.2	4.6	4.1			

A P P E N D I X A

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RESULTS OF DEER AGING TESTS

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Division of Research

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by

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Division of Research

INTRODUCTION

During September and October, 1956, short courses of instruction in aging deer jaws were given to members of the Department of Lands and Forests at Sudbury, North Bay, the Southern Research Station, Hespeler and the Forest Ranger School. All those receiving instruction (a total of 63 individuals) were given a test comprising 29 jaws. The same group of jaws was used at each location.

This report describes the analysis of the results of the tests.

METHOD

The ages of the test jaws were estimated by the author according to a modification of Severinghaus' (1949) technique and this system was used in the course of instruction. They were then numbered randomly and each student was allowed one minute to determine the age of each jaw.

When the tests were marked and the test jaws re-examined it was decided that one jaw was a sufficiently atypical specimen to warrant its exclusion from the final results.

During the instruction period criteria for ages ½ year, 1½ years, 2½ years, etc. through 8-10 years were outlined. For the test, however, candidates were allowed to lump all jaws 5½ years and over into a single class designated as "5½ plus", although they were urged to attempt an exact age determination if possible. Consequently, calculations of errors made in the older age classes are based on a smaller sample--those who volunteered a precise age for jaws 5½ years and over.

RESULTS AND DISCUSSION

Fig. 1 shows a steeply rising percentage of error from ½ year to 6½ years with 7½ and 8½ plus somewhat lower, but both over 40% and the latter nearly 60%.

Fig. 2 illustrates the results when age determinations of 5½ years and over were lumped into a single class. The very high percentage of mistakes among the "volunteers" appearing in Fig. 1 may have been the result of laxity in aging old jaws arising from the knowledge that no penalty attached to an incorrect aging provided the jaw was actually 5½ years or over.

Fig. 3 separates mistakes into overestimations and underestimations, and reveals a conspicuous tendency to overage young jaws and underage old jaws with the mid-point at 3½ years. The ratios of underestimations to overestimations in each age class were tested for significance using the chi-square test on the hypothesis that errors due to chance alone would produce ratios near 1:1. All ratios except 3½ years differed significantly from the random 1:1.

The mistakes made in each age class (except 3½ years) were examined separately to determine if one or two perhaps slightly atypical jaws might be contributing all the error in that age class. The age determinations for each jaw were tabulated and the resulting ratios were tested for heterogeneity on the basis of the difference between the total chi-square and the chi-square of the total (Snedecor, 1946, pp. 191-192). The only age class found to contain significantly heterogeneous data was 1½, which included an unusual specimen deliberately inserted in the test set. Thus the tendency to overage young jaws and underage old ones is not only significant but also uniform.

Participants' marks ranged from 13 to 28 out of a possible 28. The frequency distribution of the marks was bimodal with peaks at 20 and 23. These two groups represented roughly those who had had previous practice in aging deer (or to whom the task was for some reason easy), and those to whom the technique was either unfamiliar or difficult. The two groups were compared to test whether they made the same sort of mistakes. Fig. 4 shows that both groups experience the same increasing difficulty as the age of the test material increases. Also, a detailed comparison showed that the pattern of overestimation and underestimation discussed above, was constant for the two groups.

Eighty-six percent of all mistakes were off the correct age by one year only. The remaining 14% were in error by two years or more. Out of 119 mistakes made by Group A (marks 22-28) only four were two years off the correct age. Of a total of 282 mistakes by Group B (marks 13-21) however, 49 (17%) were two years off the correct age and 3 (1%) were three years off. Underestimation by two years of $5\frac{1}{2}$ and $6\frac{1}{2}$ year jaws (i.e. calling them $3\frac{1}{2}$ and $4\frac{1}{2}$ years respectively) were the most frequent of the gross errors.

SUMMARY AND CONCLUSIONS

Sixty-three members of the staff of the Department of Lands and Forests were tested on their ability to age deer jaws by a prescribed method. The results showed an increase in errors corresponding to increased age of the test material which ranged from $\frac{1}{2}$ year to $8\frac{1}{2}$ plus years in one year steps. The candidates exhibited a significant tendency to overage young jaws and underage old jaws with the mid-point or random error occurring at $3\frac{1}{2}$ years. Practice or aptitude reduces the degree of error but does not alter the above mentioned pattern.

An attempt could be made to minimize distortions of kill curves arising frommisaged deer by correcting for the trends shown here. However, it would be advisable to test a larger group before estimating the magnitude of the correction factors to be used.

When a small number of animals must be aged accurately or where a sample of jaws could be removed from a large number of animals, all aging would best be delegated to a single skillful and careful individual.

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Jour. Wildl. Mangt. 13 (2): 195-216.

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Iowa State College Press, 485 pp.

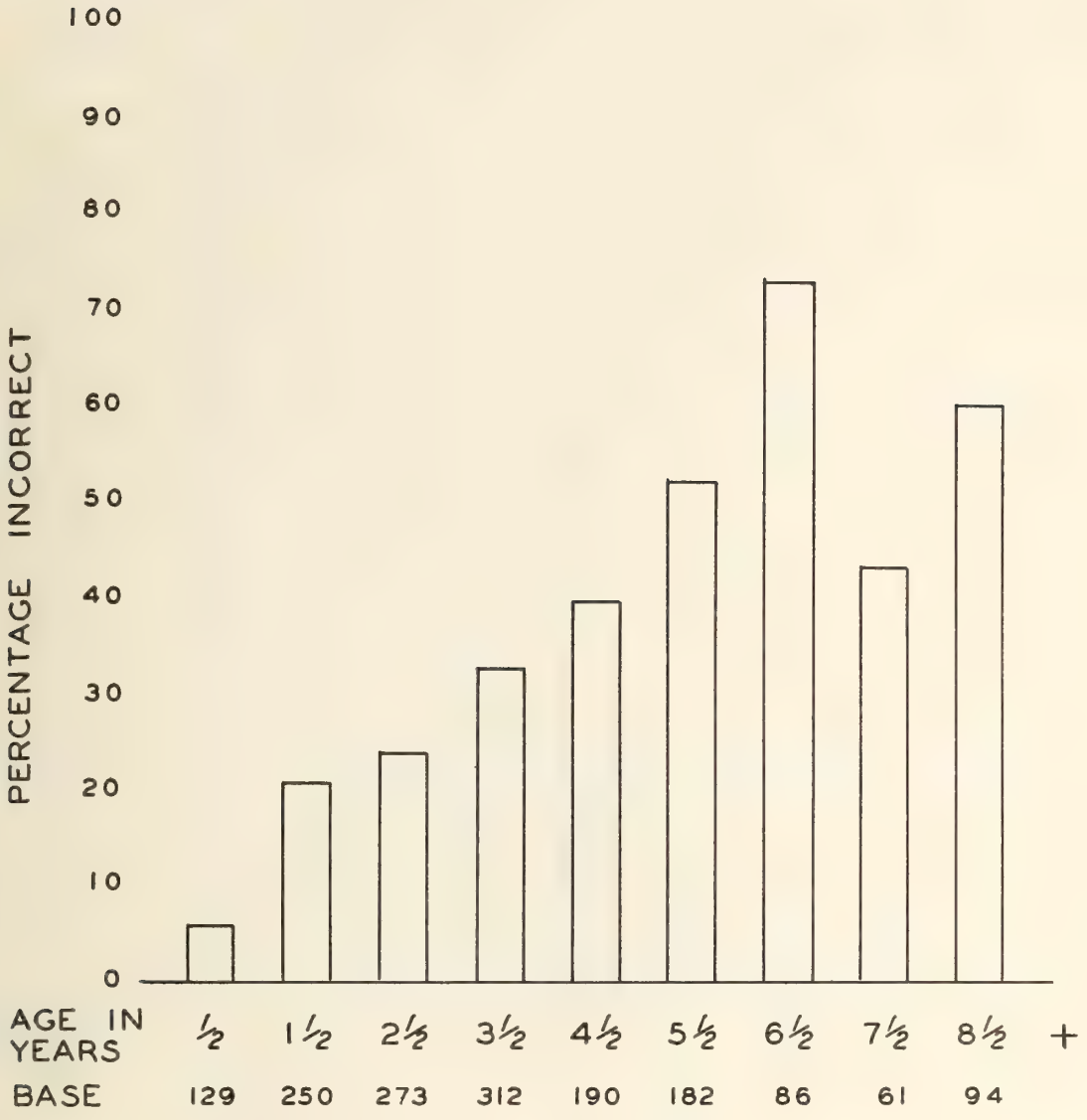


FIG - 1 *HISTOGRAM SHOWING MISTAKES IN AGEING DEER JAWS : AGE CLASSES ½ YEAR TO 8 ½+ YEARS.*

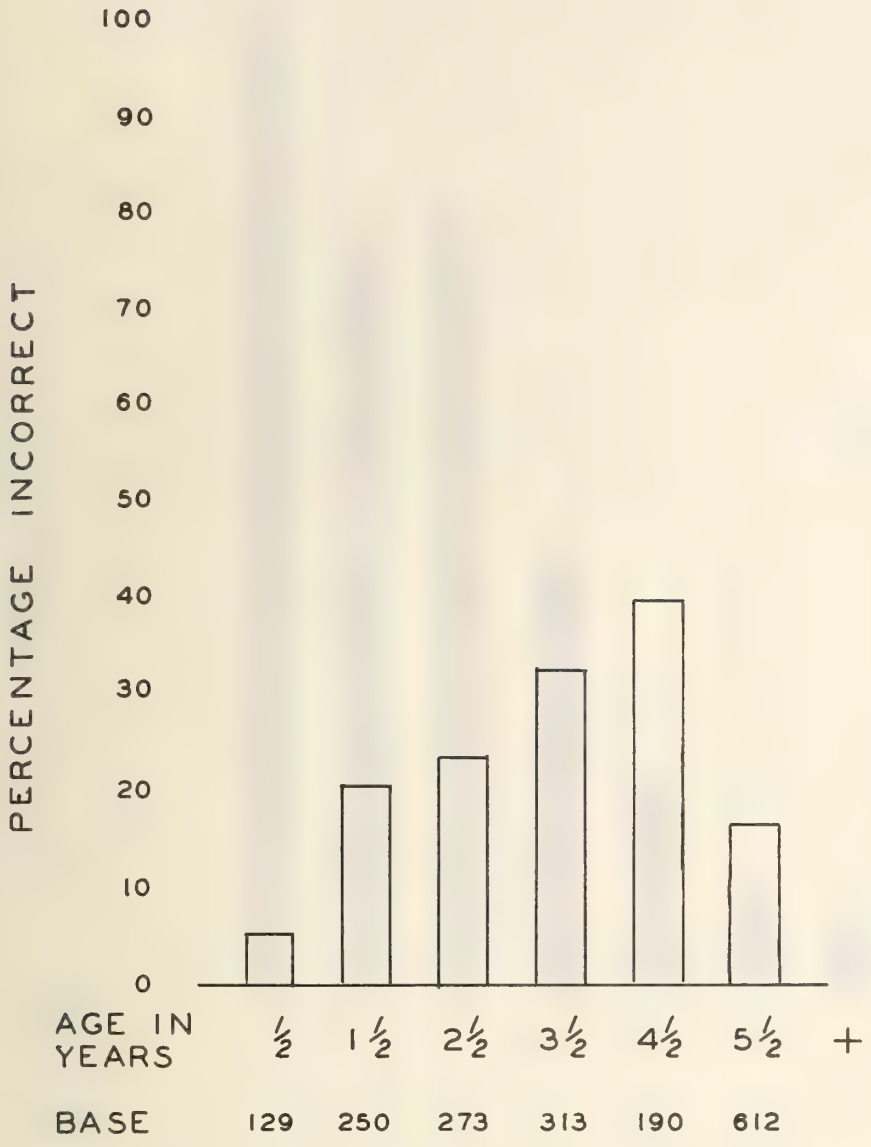


FIG - 2 *HISTOGRAM SHOWING MISTAKES IN AGEING DEER JAWS: AGE CLASSES ½ YEAR TO 5½⁺ YEARS.*

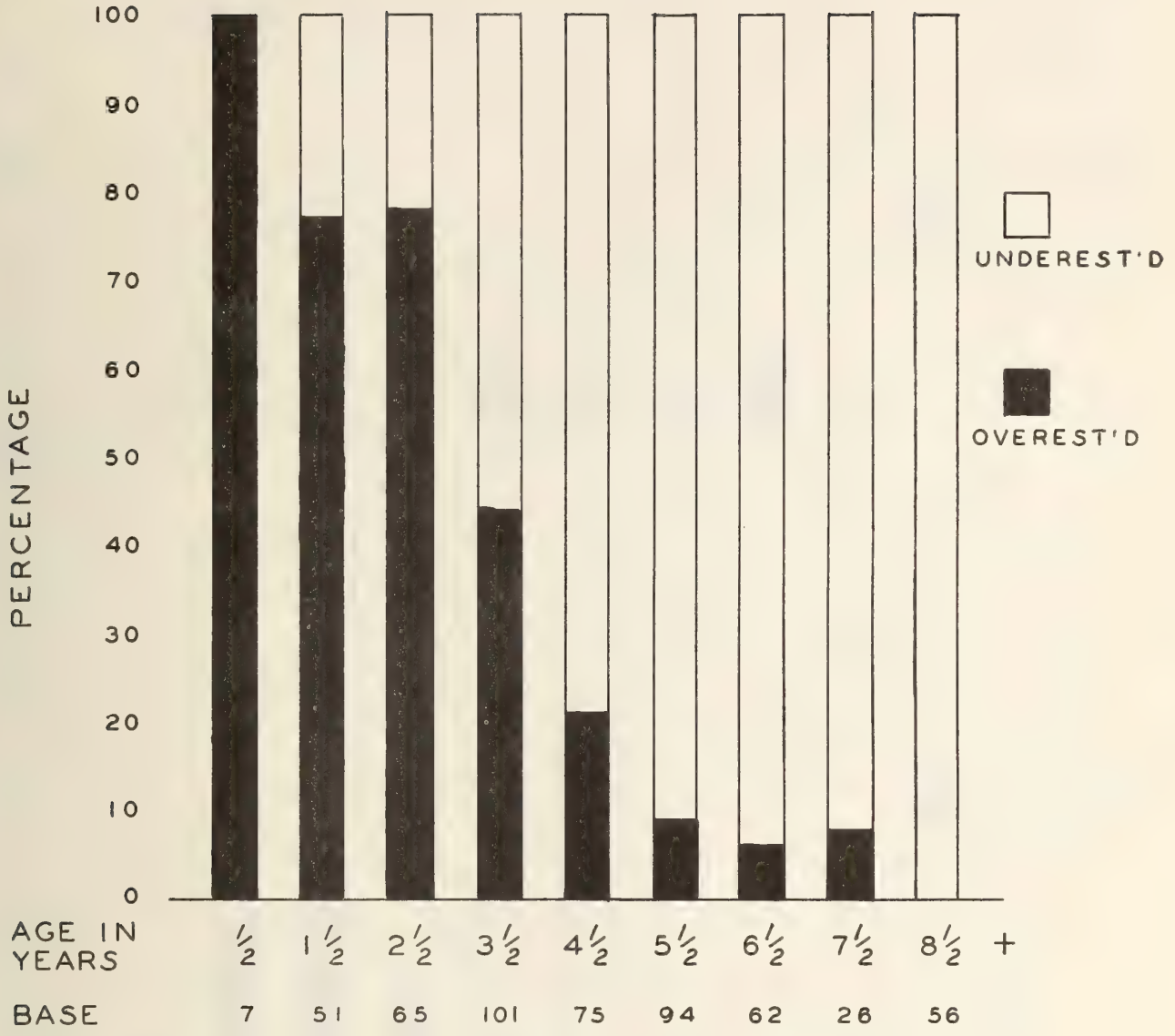


FIG - 3 *MISTAKES IN AGE DETERMINATIONS SEPARATED PERCENTAGEWISE INTO OVERESTIMATIONS (SHADED) UNDERESTIMATIONS (UNSHADED)*

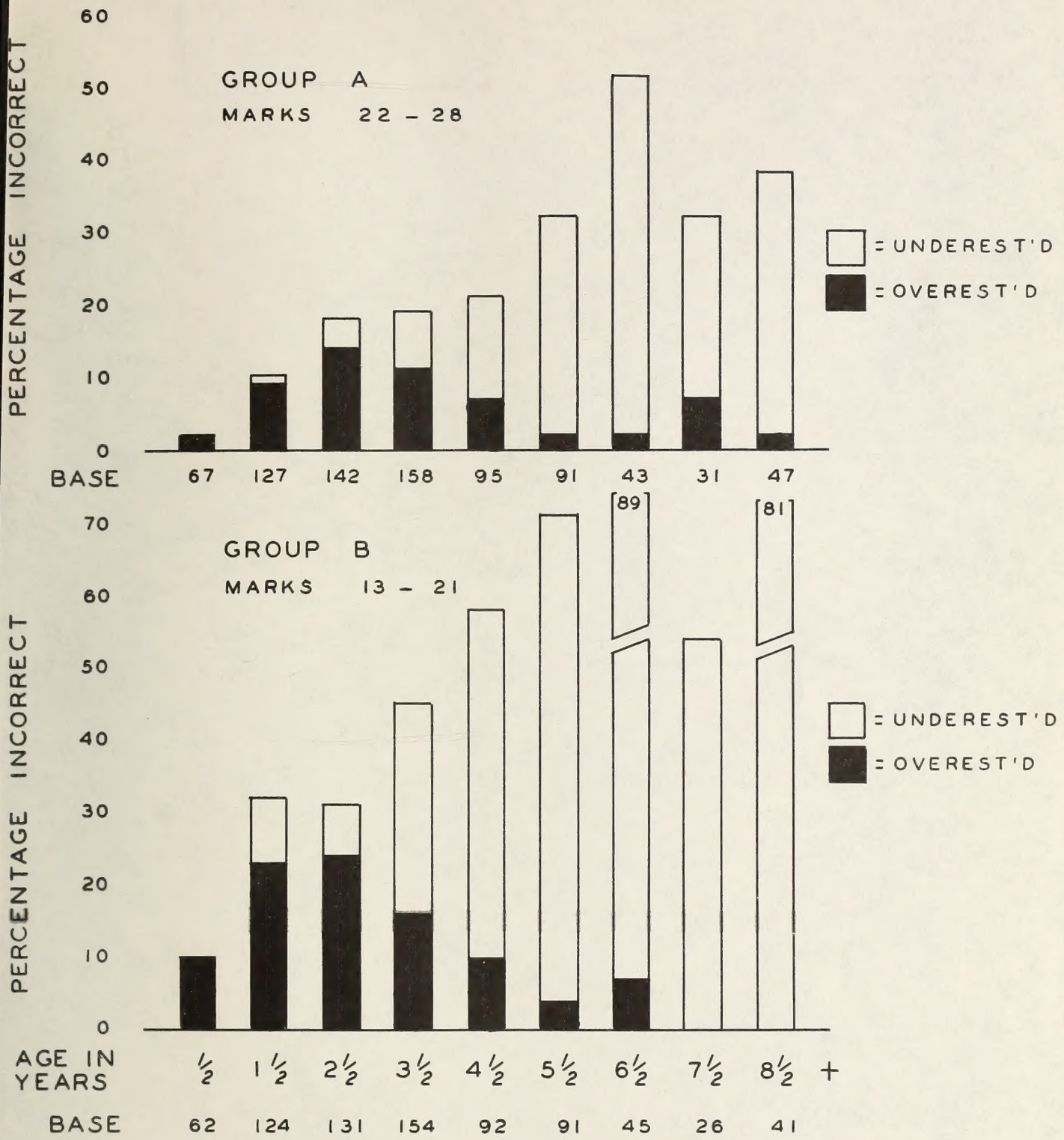
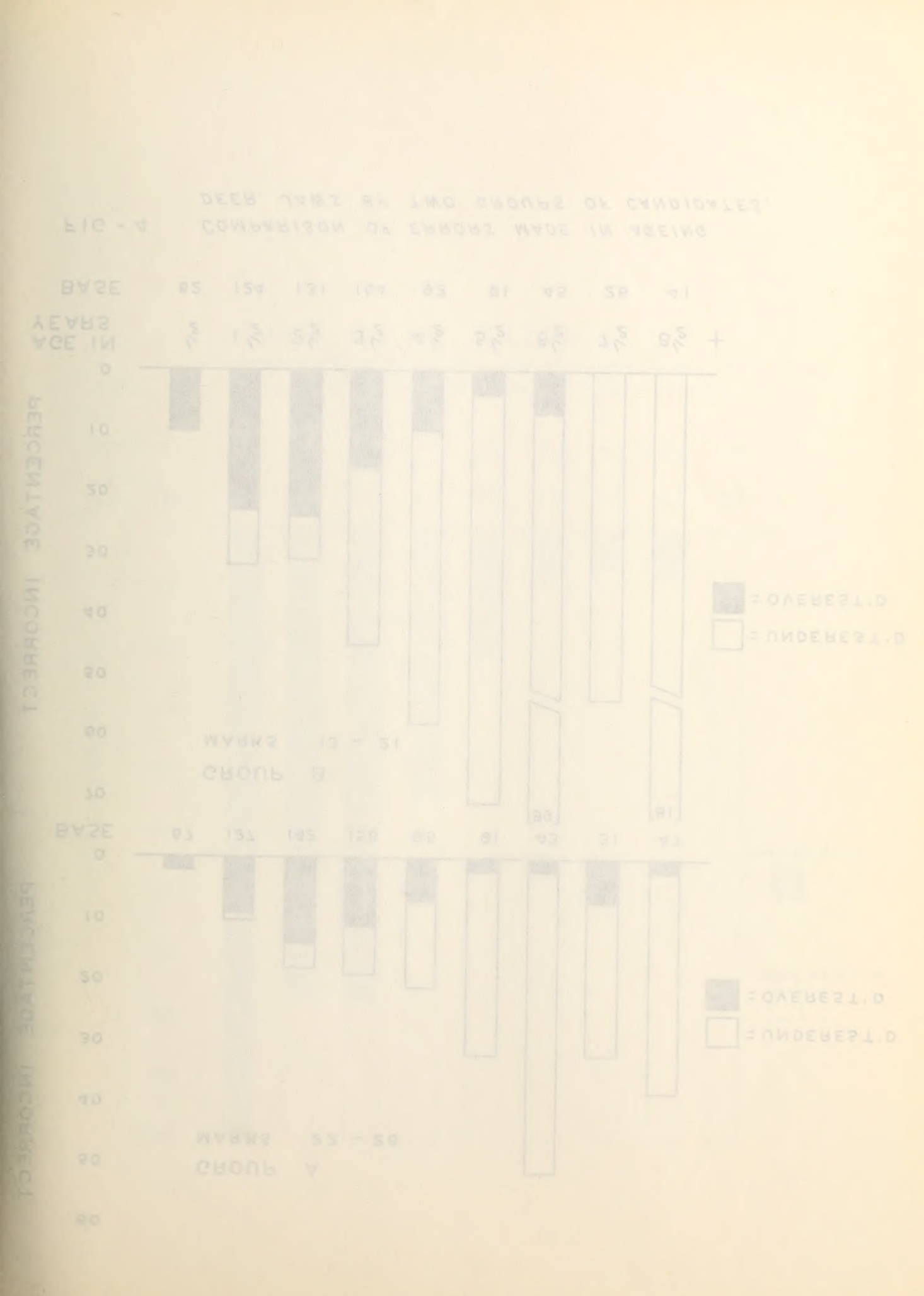


FIG - 4 *COMPARISON OF ERRORS MADE IN AGEING DEER JAWS BY TWO GROUPS OF CANDIDATES.*



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